Program Development Manual for a Comprehensive Stormwater Management Program

Gloucester County, Virginia
March 1994

VCRMP Grant Program
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I. PREFACE

It is the hope of all those who have contributed to the writing of this manual that it will serve rural local governments who are beginning to address stormwater and other water resource issues. The terms stormwater and water resource are often used interchangeably in this manual.

Water resource planning, when done in tandem with other planning initiatives, has proven to be an invaluable tool for legitimating planning decisions in the eyes of local citizenry. No one will argue against the value of preserving water resources and be taken seriously.

The products of this study are varied. Conventional land use and transportation issues have been somewhat refined and are included in the covers of this manual. This work was done with tremendous help from the following:

The Virginia Department of Environmental Quality
National Oceanic and Atmospheric Administration
The Chesapeake Bay Local Assistance Department
LDR, International
Smith, Demer, Norman
Kellerco, Inc.
Hampton Roads Planning District Commission

Gloucester County remains very grateful for the assistance that has been provided by the individuals that embody these organizations. The planning and implementation of water resource protection efforts continues.

II. BACKGROUND

In September 1992 The Virginia Council on the Environment (now the Department of Environmental Quality) provided funding to Gloucester County to begin development of a comprehensive stormwater management program. The funding was provided through the Virginia Coastal Resources Management Program (VCRMP) by the National Oceanic and Atmospheric Administration (NOAA) under the Coastal Zone Management Act of 1992. This grant program was competitive in nature, with high priority assigned to proposals that included development of comprehensive planning and ordinance language addressing stormwater issues.

The proposal ultimately submitted by Gloucester County included the incorporation of water resource management into the practice of land use, transportation and public facility planning. The concept for this project developed from the ideal that stormwater management and other water resource opportunities would not be foregone in the planning of land use and public infrastructure.

It is important to understand that Gloucester County is one of many fast growing rural counties in Virginia's Tidewater Region. Most of the population growth experienced by the county began in the early 1980's and continues today. Until the 1980's Gloucester had few if any growth issues to deal with. There were only minimal demands for public services and transportation and other public infrastructure demands were equally stable. In the mid 1980's this stability slowly began to erode as demand for public facilities began to increase exponentially.

It is imperative for the reader of this manual to understand that a sustained annual growth rate exceeding five percent, in a rural jurisdiction, is a harbinger of change that should not be ignored by anyone in the public service. This is not to imply that the government leaders in Gloucester ignored what was happening in the county, quite the contrary. The county, with great speed, managed to connect a small sub-regional sewage treatment plant to the Hampton Roads Sanitation District's facilities via a 17 mile force main. In addition the county met its increasing solid waste disposal, collection and recycling needs by contracting with a major private concern. As if that wasn't enough, the county built an approximately 4.0 mgd reservoir and water treatment facility to allow expansion of the water supply. All of these improvements were accomplished in approximately the same ten year period in which growth was accelerating. It is doubtful that this scope of

infrastructural improvement has been accomplished, in jurisdictions of similar character, anywhere in this Commonwealth, in such a time frame.

The irony of all this good work and capital investment is that it will serve to sustain the growth rate and increase demand for more public services. The presence of public water and sewer facilities has also begun to change the character and scope of development within the county. Pressures to attain customers on these immature, but expensive utilities, began to affect land use decisions. Densities are increasing, and with the increased densities more sophisticated land use policies are necessitated. The word "urban" began to creep into the dialogue and narrative of the local planning agencies. One reluctant planner coined the phrase "rurban" to help describe the ongoing phenomenon that was increasingly changing the character of the county.

After almost three years of debate, the county decided on a land use plan that encourages development in an area encompassing roughly 40 of the county's 225 square miles. Concentrating Development in this manner will do two things: first, it will leave the rural areas of the county somewhat intact; second, because development within the 40 square mile Development District will be serviced by public water and sewer the hazards associated with in-ground sewage disposal and increased groundwater withdrawals will be diminished. This land use policy also enjoys political favor because it helps to provide customers to the expensive utility systems, thereby spreading their cost among more users, resulting in lower water and sewer bills for constituents.

However, the prospect of increased densities in such a large area of the county raises other environmental concerns. Increased percentages of impervious cover will lead to stormwater management problems from both a quality and quantity perspective. Increased densities will also create more demand for roads, parks, schools etc. with reasonable accessibility. The social and even psychological impacts to residents in these areas must also be considered. In essence almost everything related to public service changes in those areas where urban density occurs.

It is hoped that this manual will help rural jurisdictions, that are trying to cope with accelerated population growth, begin to understand some of the options available to deal with the inevitable changes that will occur. The products of this research are bent toward water resource preservation, but

for the planners involved, the greater satisfaction came from the broadened definition of the exercise labeled "comprehensive planning".

This manual has two district sections; Land use and Public facility planning. Both were written with a predisposition toward their effects on water resource management. In fact, water resource management along with public facility location have become the primary determinants for land use planning decisions. Water resource management has evolved to this status, almost coincidentally, to augment other major land use decisions; such as, preserving agriculture, watersheds and wetland areas. Public facility locations have served to effect land use in more obvious ways; such as, increasing residential densities and allowing for other more intensive land uses. In addition to their land use implications, public facilities, such as roads, provide conduits for stormwater conveyance and may often provide for impoundment opportunities when alignments are carefully planned.

The challenge now before Gloucester County is to implement the planning policies that have been developed. This manual cannot fully address implementation because it has been written prior to full implementation. However, it appears that there are three alternatives for stormwater management that deserve careful attention; conventional on-site detention, private development construction/maintenance associations, and stormwater utility programs.

For pure simplicity, the on-site retention method is, by far, the easiest method. A jurisdiction simply adopts an ordinance and orders everyone to comply. In the long term the aggregate money and effort used to construct and maintain these numerous facilities will likely prove this method to be somewhat insane for all but limited applications. Some of the approved management practices used today (e.g. infiltration trenches and retention ponds) are known to require expensive and chronic maintenance. Also, the symptoms from lack of maintenance do not often manifest themselves in an obvious manner, thereby making it difficult for everyone to know when maintenance is required.

Private maintenance associations, with the local government included as a party, approach a more practical solution inasmuch as the number of management facilities can be significantly reduced. Maintenance, and member contributions for such, can be programmed into these agreements, thereby preventing the often unexpected large cost associated with preserving such

facilities. Such larger facilities may also serve to aggregate open space within developed areas and therefore improve the aesthetics of the area served.

The installation of a stormwater utility program is probably the most practical, and controversial, option available to Virginia local governments. It is politically controversial because it involves establishing a new tax and increasing the local bureaucracy. The establishment of such a utility will soon, if not presently, subject the utility owner to regulations enforced by the Environmental Protection Agency (EPA). These regulations have been known to be extremely expensive to meet, and should therefore be carefully researched by anyone proposing a stormwater utility. The positive elements of a utility structure are its ability to raise adequate money for construction and maintenance projects when and where they are most needed.

It is apparent that, for now, Gloucester will choose to implement its stormwater program by utilizing an ordinance approach. When it is feasible, sub-regional practices will also be encouraged. This ordinance approach is the preferred option for the short term only. Gloucester is simply not in a position where it can create a utility in short order. The county planners also hope to work with state agencies to facilitate the creation of a broader spectrum of options available to local governments who are attempting to customize a stormwater management program to their specific needs.

III. WATER RESOURCE & LAND USE PLANNING

Probably the most provocative exercise performed in the development of Gloucester's planning program was the incorporation of water resource planning into land use planning. Land use planning will invariably include arguments supporting different positions that can be taken when placing use designations on land. Very often, the process seems to be somewhat arbitrary to those who are not fully involved in the research that led to an initial set of draft proposals. The most troublesome decisions were centered on the rationale used to determine where extremely low densities would be encouraged by the land use plan. Preserving rural character for the sake of character alone was inadequate rationale for Planning Commissioners proposing to limit property owners' development rights. This stalemate continued for almost twelve months, and this impasse threatened the fundamentals of the entire planning process.

One of the two large areas being proposed for low density (1 unit/5 acres) development had a predominance of hydric soils with large areas of non-tidal wetlands. This same area has very little topography with elevations reaching no more than ten feet above mean sea level. This area was appropriately named "Bayside District" on the draft Land Use Map which was the subject of debate before the commission. The line that was drawn separating the Bayside District from the "Primary Development District" was placed along a well defined, topographic escarpment which elevated the Development district approximately twenty feet above the Bayside District. In spite of what, to planners, appeared to be excellent reasoning for such a designation, the commission remained deadlocked.

In what now seems to have been an act of divine intervention, planners received a copy of a report from the Army Corps of Engineers entitled, "Virginia Hurricane Surge Atlas", for the Chesapeake Bay Region, dated August of 1991. This atlas included a number of maps of Gloucester County and illustrated what areas of the county would likely be inundated by a storm surge in the event of an unfortunately well placed hurricane. This atlas showed the Bayside District to be underwater in such an event. The planners brought this new information to the commission at a time when the news media was covering the tragic loss of life from a typhoon that struck Bangledesh. Bangledesh has a low lying area that is the chronic victim of typhoons. In spite of this danger, its residents have historically re-occupied this area after the floods recede and the Planning Commission could now relate issues of

public safety and sheer common sense to the plan. These comparisons were clearly drawn by planners, and the impasse on the Bayside District was quickly resolved.

The water resource benefits associated with the Bayside District go beyond the intrinsic value of wetlands preservation. The proximity of these wetlands to the Primary Development District allows them to accept and treat suburban run-off in a natural manner. The Primary Development District is, in essence, serviced by the Bayside District and the two tend to compliment each other.

The other large area of the county being considered for equally low density is labeled the "Countryside District" (please note the use of euphemistic titles). This district was originally being considered for low density (1 unit/five acres) due to the predominance of agricultural land use and because it was not serviced very well by roads and other public facilities. The same problems within the planning commission relative to the Bayside District prevailed. The Commission felt they needed a more practical rationale for the designation.

During this struggle, the County had just begun to operate a new water treatment facility that was supplied water by an equally new 635 acre reservoir. This brand new facility was an extremely controversial endeavor for the County primarily due to its cost. The watershed for this facility included an expanse of land area within the proposed Countryside District. When the County first began to plan for the reservoir it hired a consultant to perform a site selection survey and environmental impact analysis for sites that scored high in the selection matrix. The site that scored highest was the Beaverdam Reservoir site, the one that was subsequently built. The two sites that scored second and third, far ahead of the fourth site, both had contiguous watersheds to the Beaverdam site. The engineering study that had been done to select the best sites for future surface water supplies, gave rise to the realization that all potential watersheds for surface water supplies were contiguous, and located entirely within the Countryside District.

Therefore, if the County was going to: contain sprawling development patterns, preserve agricultural use of land, open space, some of its rural character, and its potential water supplies from development; the Countryside District was a rationale first step. The Planning Commission agreed that the land use plan should attempt to protect the existing reservoir and other

valuable watersheds, and for all the above reasons approved the beleaguered land use plan.

As the reader may detect by now, water resource planning has served to remediate some of the political problems associated with land use planning in Gloucester. This should not be viewed as a cheap tactic, but one that recognizes the political realities of local government.

Population, Household and Employment Projections for Gloucester County

Introduction

This memorandum develops the rationale for a series of projections made for Gloucester County and presents these forecasts. This effort is part of a 1994 Comprehensive Plan Supplement, which focuses on balancing land use and transportation planning for the County. This study is based on the assumption that future land use proposals should be in some reasonable balance with future transportation plans.

The analysis of the land use/transportation interface is to be accomplished through the use of a computer simulation or model which projects future traffic in the County based on its future population and employment growth. The computer model for the County, developed by the Hampton Roads Regional Planning District Commission (HRPDC) is part of HRPDC's larger computer model for the region. Thus it incorporates into its results for Gloucester County the effects of population and job growth throughout the region, and vice versa.

In subsequent sections of this memorandum, the background of current thinking on land use and transportation for the County is presented followed by an analysis of its buildout capacity so as to assess what the Plan's long term vision of the County means in terms of population, housing and employment. The buildout scenario is necessary because the Comprehensive Plan accommodates such a large amount of land use change without specifying its supporting transportation infrastructure.

Stepping back from the long term picture, we next develop shorter term projections for the County based on a Trends and Accelerated Growth scenario. Finally, these County-wide growth scenarios are broken down into smaller subareas for the more detailed growth projections that will drive the traffic model.

Background on Land Use and Transportation Plans for the County

The current Comprehensive Plan was developed in 1988/1989 and was adopted in 1991. Its bottom-line product is a county-wide future land use map with associated text. This map significantly increases the land to be used for medium density development beyond the current limited single family zoning pattern. It creates a Development District, from the Point to

the Courthouse of about 35 square miles with Rt. 17 as its spine. Within this District, densities are envisaged at 4 to 5 units per acre on public water and sewer. By way of comparison, the current single family zoning district with 10,000 SF lots on public water and sewer, yields about 2.5 to 3 units per acre. While the extent and intensity of the County's suburban development areas is increased in the Plan, the Plan decreases the development yields in its rural areas. Currently the rural residential zone allows 1½ acre lots; the Comprehensive Plan proposes 1½ or 5 acre lots, depending on location.

The net effect of the land use changes is to allow for a very large future increase in residential population. This future development capacity is quantified in the next section.

The commercial zoning that runs the 12 miles along Rt. 17 from the Point to the Courthouse is not explicitly modified in the Comprehensive Plan. The Plan states a preference for larger and deeper "nodes" of commercial development rather than a continuous, shallow strip along the corridor, but it does not explicitly propose an alternative pattern. The Plan, however, does propose an overlay zone on the corridor which would address aesthetics and access management. The unofficial Citizens Plan for Gloucester Point, however, proposes to reduce the amount of retail zoning and substitute in its place employment zoning.

Like the residential capacity, the commercial zoning, which is only partially developed to date, also has very significant future development capacity. Abutting the corridor, the Plan identifies a 500-acre area for future industrial development, just south of the Courthouse, which is currently the site of the former airport and golf course.

These significant increases in capacity for future development will require supporting infrastructure. The Plan's transportation element shows a future collector road, parallel to and east of Rt. 17 from the Courthouse to the Point. Its purpose is to remove local, short-distance vehicle trips from Rt. 17 and to interconnect neighborhoods. The Plan also shows a new crossing of the York River, from Ark to Williamsburg, as a reliever for the southbound traffic on Rt. 17. The alignment of this northern bridge crossing is the result of a planning study conducted by VDOT and documented in a Draft Environmental Impact Statement in August, 1988.

Another study VDOT of the Rt. 17 corridor in March, 1992 proposed a series of connecting parallel roads to Rt. 17 at its southern end. The same study proposes that Rt. 17, currently four lanes, be increased to six lanes for a 2.4 mile portion of its length from the Coleman Bridge northwards to Rt. 216 and that various improvements to its current four lane section should be made along its middle stretch northward for another 2.9 miles (to north of Rt. 667). From Rt. 667 to Rt. 17 Business at Gloucester Courthouse, the study proposes selected improvements at particular intersections, crossover modifications and circulation improvements. The total cost estimate of these improvements was approximately $30.5 million. The VDOT study did not include a traffic forecasting element.

The 2010 Highway Needs Study by VDOT, completed in April, 1991 with the assistance of HRPDC, shows projected volumes in 2010 along Rt. 17, which it proposes as a six lane facility along its twelve mile length. It shows the Coleman Bridge as a four lane facility and also the new northern crossing as a four lane facility. Projected traffic volumes on these two bridges are shown as roughly equal, i.e. in the 24,000 to 27,000 ADT range. The Northern Crossing Alternative Study and the 2010 Highway Needs Study preceded, and were therefore not based on the land use, population and employment recommendations and proposals of the 1991 Comprehensive Plan. The transportation element of the Comprehensive Plan itself did not include a forecast of future traffic needs.

A major purpose of this Comprehensive Plan Supplement is to relate the future land use plans to future transportation needs and to update these earlier plans and projections. This will require a review of past population and employment projections and the development of forecasts consistent with the Comprehensive Plan. The time horizon of these projections is important since the timeframe of the land use plan should relate to that of the transportation plan. If, for example, the Comprehensive Plan represents a preferred pattern of land uses that would be developed in 50 years time, then the transportation system in the Plan should be capable of supporting this land use pattern in 50 years time.

The Holding Capacity of the Current Comprehensive Plan

Holding Capacity refers to the number of people, dwelling units and employees that the County can absorb at buildout. The terms holding capacity and buildout are used interchangeably.

A buildout analysis was conducted in 1990 for the County's Department of Public Utilities so as to size sewer pipes to handle ultimate capacity. In this analysis, different sewer sheds were reduced to a net acreage by removing hydric soils and maximum development densities were then applied with the guidance of the Department of Community Development. Since they were not based on the Comprehensive Plan, they need to be updated for this Supplement.

To yield holding capacity, the allowable density or lot size recommended in the Comprehensive Plan cannot simply be multiplied by the acreage of the differently designated development areas in the Plan. One must deduct for existing development, wetlands, soils unlikely to perk, steep slopes and roads. In addition, some lands will also be used for schools or parks or will simply be held off the development market by owners who will retain them as large estates and not subdivide. All of these qualifiers must be factored into holding capacity analysis.

Table 1 presents a holding capacity analysis which takes the above factors into account and differentiates between the Development District and other areas based on the densities and policies of the Comprehensive Plan. The Citizens' Plan for Gloucester Point and Courthouse were used for these areas even though they have not been formally adopted. The overall yield of the County at buildout, 72,752 units, includes the 1990 total of 12,443 units. This total is divided between 48,567 units in the Development District and 24,185 in the County's rural areas. In the table, these numbers are also converted to population figures.

The County's holding capacity for employment is based upon buildout of the current Rt. 17 corridor zoning and the new industrial employment areas shown on the Comprehensive Plan. Table 2 shows these calculations. In all, over 22.5 million square feet of future commercial development and almost 8 million square feet of future industrial space can be accommodated. Currently, there is about 1.3 million square feet of commercial development in the County.

When will buildout of the Comprehensive Plan occur and what are some intermediate points of growth along the way? We now turn to projecting rates of growth for the County.

*Table 1: Gloucester County Buildout Projections Based on Density Factors**

	Development District				Rural Areas				Total (±100%)
	Gloucester Courthouse	Gloucester Point	Suburban Residential	Subtotal	Suburban Cntryside	Rural Cntryside	Bayside	Subtotal	
Total Acres[1]	5,462 4%	5,475 4%	13,853 9%	24,790 17%	39,251 27%	48,481 33%	34,385 23%	122,017 83%	146,807
Acres Developed	1,325 5%	3,421 14%	2,790 11%	7,536 30%	5,310 21%	2,173 9%	9,907 40%	17,390 70%	24,926
Vacant Acres Undevelopable	1,008 11%	736 8%	1,485 16%	3,229 35%	2,386 24%	3,670 38%	243 3%	6,299 65%	9,528
Vacant Acres Developable	3,129 3%	1,318 1%	9,578 8%	14,025 12%	31,555 27%	43,838 38%	25,473 23%	100,866 88%	114,891
Unit Yield	10,234 17%	4,031 7%	28,734 48%	42,999 72%	9,648 16%	5,608 9%	2,054 3%	17,310 28%	60,309
Existing Du Households	913 7%	3,569 29%	1,086 9%	5,568 45%	3,375 27%	1,256 10%	2,244 18%	6,875 55%	12,443
Total Du at Buildout	11,147 15%	7,600 11%	29,820 41%	48,567 67%	13,023 18%	6,864 10%	4,298 5%	24,185 33%	72,752
Pop. per HH at Buildout	2.2	2.2	2.2		2.2	2.2	2.2		
Total Addtl. Population	22,515 17%	8,868 7%	63,215 48%	94,598 72%	21,378 16%	12,338 9%	4,519 3%	38,235 28%	132,833
Existing Population	2,385 8%	8,481 28%	3,105 11%	13,971 47%	7,821 26%	3,408 11%	4,931 16%	16,160 53%	30,131
Total Pop. at Buildout	24,900 15%	17,349 11%	66,320 41%	108,569 67%	29,199 18%	15,746 10%	9,450 5%	53,635 33%	162,964

[1]Actual total acreage is 144,000; discrepancy due to water areas, rounding, et

* The following density factors were used:

Development Yield in Septic & Well Areas (Acres per Unit)			
	Comprehensive Plan Areas		
MPPDC Analysis Categories	Suburban Countryside	Rural Countryside	Bayside
Suitable	1.5	5	5
Slight Limitations	3	7	7
Severe Limitations	5	10	10
Floodplain	20	20	20

Development Yield in Development District (Units per Acre)				
	SF-Low Density	SF-Med. Density	V Core - MXD	PUD
Gloucester Village	1.5	3	6	6
	Suburban - LD	One-Family	Village	
Gloucester Point	1	3	6	
Area In-Between (Suburban Residential)	Assume 3.0 du/Acre			

Table 2: Gloucester County

Derivation of Commercial Holding Capacity

SF of B-1 Zoning along Rt. 17	85,323,520 SF
SF of Commercial in Gloucester Courthouse	6,098,400 SF
Total B-1 SF	91,421,930 SF
At .25 FAR	22,855,482 SF

Derivation of Industrial Holding Capacity

Acres of Land in Comprehensive Plan for Industrial Park at Airport Site	500	
Acres of Land on Comprehensive Plan for Industrial Park in Northeast Gloucester Courthouse	90	
	590	Acres
At 13,000 square feet per acre	7.7	Million Square Feet

Growth Projections Over Time

Population

In addition to the buildout study for the County Department of Utilities referred to above, there are at several other recent sources of growth projections: these include those done for the Comprehensive Plan itself in 1988 which projected out to the year 2010 and those done by HRPDC as part of its region-wide forecasting program in February, 1993, which projected out to the year 2015.

These two projections are compared in Table 3. The Comprehensive Plan numbers are higher than HRPDC's, for an increase of over 8,000 units over the 20 years. This equates to a population increase of over 18,000 people. HRPDC projections are expressed in terms of population and must be converted to dwelling units using a household size. Table 3 shows trends in household size for Gloucester County and projects them into the future. HRPDC population yields an increase of about 4,230 units to 2010, or about 211 per year over the two decades. In 2015, HRPDC projects a total of about 47,000 people in approximately 18,000 units.

The Comprehensive Plan's projections average 414 units per year. By way of comparison, the 1980's averaged 624 units permitted per year, with a high of 951 units in 1985 and a low of 340 in 1989. Recent recession-bound permits have averaged around 300 per year. HRPDC assumes a reduced pace of growth for Gloucester County based on its recent regional assessment of future job and population prospects.

In addition to the two projections above, The Virginia Employment Commission (1993) and the County's own Recreation and Parks Department (1990) have also published projections. VEC's are roughly midway between the Comprehensive Plan's and HRPDC's, while the REC Plan's numbers are very high compared to all the other projections.

When viewed against the overall holding capacity of Gloucester County of 72,752 units, however, the projections of either the Comprehensive Plan or HRPDC show how small a fraction of total growth (roughly, 17% or 9%, respectively) will be absorbed in the County over the next 20-25 years. In fact, the County can absorb between 100 and 200 years of future growth if the Comprehensive Plan or HRPDC's respective rates are extended into the future as a straight line! Seen over such a long time span, the differences between the Comprehensive Plan and HRPDC's numbers are minor.

Table 3: Gloucester County Population and Household Projections

	Population						
	1990	**2000**	**2010**	**2015**	**2020**	**2030**	**Buildout**
State VEC (1993)	30,131	39,042	46,049	49,553**	53,056	60,063	
HRPDC	30,131	37,911	43,862	46,973			
Comprehensive Plan	30,131	40,314	48,509	--			150,000
Rec Plan (1990)	30,131	47,474	58,739	--			
	Households**						
Persons per Household (HRPDC)	2.72	2.64	2.58	2.54			2.44
HRPDC Households	12,443	14,145	16,678	18,086			
Comprehensive Plan	12,443	16,590	20,730				61,640

* Households multiplied by person/household do not add up to the population because of a small percentage of population residing in group quarters.

** By interpretation.

*** Derived using same annual rate from Plan for 1990-2010.

Employment

Historical employment figures and their projections by the HRPDC are shown in Table 4. Their associated job to housing ratios are also shown in Table 4. HRPDC's projections, done in February, 1993, reflect recent cutbacks in the military/industrial base of the region and anticipate a generally slower pace of future growth than earlier projections.

Projections

Trend Projections

Housing projections were developed for Gloucester County based upon Buildout for a Trend Rate and an Accelerated Growth Rate. Each of these curves is roughly S-shaped. (See Figure 1) They reflect the typical pattern of suburban growth which starts off somewhat slowly and then increases rapidly before tapering off as development approaches buildout. The Trend Growth line is based on approximately 414 units per year as an average figure, the same as in the Comprehensive Plan of 1991. This is, however, an average figure since at its peak growth will exceed this number but it will slow down to considerably less than this number as buildout approaches.

This is almost double HRPDC's annual rate of 225, but we believe it can be justified on several grounds: a plentiful and cheap land supply and affordable housing; simplicity of doing business in a generally pro-growth atmosphere; new availability of sewer and water; the widened Coleman Bridge; a future northern bridge crossing to Williamsburg; and a reputation for good schools.

The housing projections to 2015 are shown in Table 5. Employment projections utilize the jobs/housing ratios established in Table 4 and this increases the employment figures through 2015 compared with HRPDC's. The logic of interdependence between population and employment holds in that most employment in Gloucester County will likely be service-oriented and thus dependent on population growth.

Accelerated Growth

This scenario assumes that the widening to four lanes of the Coleman Bridge, the availability of sewer and water, the County's low land costs and the continued growth of jobs in the region will make Gloucester as attractive to newly residential development as **in the peak years** of the '80's. Potential growth will average 920 units per year but is at a slower rate than this out to 2015. Employment growth will accelerate in the latter years of this timeframe as the local population base begins to support more local-

serving employment uses and the labor force becomes large enough to attract some new industrial/manufacturing uses.

Table 5 shows the results of the above two scenarios. Buildout would occur within 60 years under the Accelerated scenario and within 110 years under the Trend buildout.

Within these scenarios, the holding capacity of the Master Plan establishes the final mix of Development District versus Rural housing. These proportions (67 and 33% of the growth increment respectively) are held as fixed points at buildout, and the current split between Rural and Development District housing in 1990 is used as the beginning point. The growth curves tie beginning and end points together as the Rural component decreases compared to the Urban component over time. Thus as the attached table indicates, the significant proportion in Rural development in 1990 (55%) decreases to 52% in 2015 Trend and to 47% in 2015 Accelerated scenarios. The curve is set, however, to portray a rapid absorption of rural lots in the next 25 years, mirroring the pattern of the 1980's. Thus, by 2015 Accelerated, 70% of the rural capacity has already been absorbed, but only 38% of the Development District housing.

Table 4: Employment Projections by HRPDC

	1970	1980	1990	2000	2010	2015
Employees*	3,417	6,316	9,513	14,034	16,583	17,430
Households	4,732	7,500	11,077	14,145	16,678	18,086
Jobs/Housing Ratio	0.72	0.84	0.85	0.99	0.99	0.96

* 1990 data is from the Bureau of Economic Analysis.

Table 5: Gloucester County Growth Increments by Scenario

	1990	2000	2010	2015	Total Increment	Overall Total
Trend Growth						
*Population	30,131	13,648	9,886	4,431	27,965	58,096
*Housing Units	12,443	4,140	4,140	2,070	10,350	22,793
Employment	9,500	4,099	4,099	1,987	10,185	19,340
Jobs/Housing Ratio	0.85	0.99	0.99	0.96	0.98	
Accelerated Growth						
*Population	30,131	27,007	22,437	10,450	59,894	90,925
*Housing Units	12,443	9,200	9,200	4,600	23,000	32,443
Employment	9,500	9,108	9,108	5,060	23,368	29,820
Jobs/Housing Ratio	0.85	0.99	1.0	1.1	1.02	
***Buildout**						
Population	30,131	--	--	--	132,833	162,964
Housing	12,443	--	--	--	60,309	72,752
Employment	9,500	--	--	--		
Jobs/Housing Ratio	0.85	--	--	--		

Longer Term Growth and the Transportation Model

The Comprehensive Plan represents a an increase in capacity of about 183% to 285% over the 25 year trend and accelerated growth scenarios, respectively. Comprehensive Plans typically provide for an "overage" of between 25-100% of their 20 year projections, i.e. for a 25-40 year period so as to allow the free market to operate efficiently, to avoid raising the cost of land by restricting its supply, to prevent large tract holders from monopolizing and distorting the market and to account for the effects of land held off the market. The safety factory or overage in the Gloucester Comprehensive Plan is thus unusually large. If new zoning were approved in accordance with this Plan, extensive and non-contiguous areas could be developed throughout the Development District and rural areas.

The Comprehensive Plan requires a complementary transportation system that will support this long term buildout at reasonable levels of service for future traffic. Admittedly this is extreme crystal-ball gazing, but showing what the transportation needs of the Plan as adopted are will be a useful discipline. It will provide a more realistic appraisal of the land use plan; the need for future roadways and their alignments can then more easily be identified, the long term effect of the new northern crossing can be assessed and the long term effectiveness of parallel connector roads for the north/south corridor can be evaluated.

In the computer simulations, a buildout scenario will also be modeled to see what light it can shed on current planning. In order to model the buildout scenario, regional growth and trips will also be factored to a longer term timeframe.

The Trend and Accelerated Scenarios will be modeled both with and without the northern crossing to assess the effects of this bridge. The Buildout will be modeled including the crossing only.

Sub-Area Allocations

The previous projections have dealt with growth on a County-wide basis. As our earlier discussions of the Comprehensive Plan indicated, growth will vary significantly by sub-area depending on its land use designation, environmental constraints and so forth.

The traffic model, in order to simulate future volumes at given points in the road system, and in order to be sensitive to the effects of land use change,

divides the County into a large number of sub-areas called Transportation Zones (TZ). Figure 2 shows these sub-areas. For each of these TZ's, population, households and employment figures must be derived.

Using various existing data sources, the 1990 population and employment figures were allocated to the 1990 TZ's. With these zone's holding capacity as a backdrop, and recognizing existing development and population, the Comprehensive Plan land use designations are used as a guide for future sub-area allocations for Trend, Accelerated and Buildout scenarios.

Methodology for Allocating Growth to Transportation Zones

Residential Development

Residential allocations for the county were developed around two possible growth scenarios for Gloucester County. These two scenarios were concerned with the effects on County growth patterns with or without a new bridge crossing of the York River, and, therefore were called "With Northern Crossing" and "Without Northern Crossing". Both of these scenarios were then developed under two different growth rates, "Trend" and "Accelerated."

With Northern Crossing

This scenario operated under the assumption that growth would occur evenly over the county, from north to south, because of new bridge crossing would encourage growth in the northern part of the country. However, an additional assumption was also made which stated that there would be a tendency for the high-amenity areas of the county to develop at a quicker rate than the rest of the county. For our purposes, we defined the "Amenity Zones" as those traffic zones with substantial water frontage (see figure ___). The remainder of the traffic zones were termed "Interior Zones". These zones were also utilized in the "Without Northern Crossing" scenario.

By taking the total increment of build-out units in the amenity zones (18099 du) and dividing that number by the total increment of build-out units county wide (60,309 du), the percentage of amenity zone units (30%) can be applied to both the total Trend and Accelerated units to determine what an even allocation of units to the Amenity Zones would be (.30 x 10,350 = 3,105 du and .30 x 23,000 = 6,900 du, respectively). These two numbers were then factored by 140% (4347 du and 9660 du, respectively) to reflect

a greater rate of growth within the Amenity Zones. Then, by subtracting the Amenity allocation from the total allocation to the Interior areas could be calculated. (6,003 du and 13,340 du, respectively).

The next step was to allocate these subtotals to each traffic zone. Keeping the zones grouped in "Amenity" and "Interior", the build-out increment for each zone is divided by the total build-out increment for Amenity or Interior areas, and a percentage is therefore calculated for each zone. This percentage is then multiplied by the total Amenity or Interior allocation to give the specific traffic zone allocation.

Example:
TZ 438 is in the "Amenity" area, and has a total build-out growth increment of 4,980 du. The total build-out growth increment for the "Amenity" area equals 18,099 du. Therefore, 4,980 18,099 equals 27.5%. This percentage multiplied by the total Amenity allocations (4,347 du and 9,660 du) gives the specific allocation for TZ 438 (1,195 du, trend, and 2,657 du, accelerated). These allocations are then added to the existing units (250) for the final allocation for TZ 438 (1,445 du and 2,907 du, respectively).

Without Northern Crossing

This scenario is based on the assumption that without a new bridge crossing of the York River, the southern portion of the county would grow more rapidly than the northern portion of the county. The line separating the northern traffic zones from the southern is shown in figure __.

Under this scenario, 60% of both the trend and accelerated scenarios is allocated to the traffic zones in the south, and 40% to the north. This yields the following breakdown:

	Trend	Accelerated
40% - North	4,140	9,200
60% - South	6,210	13,800
Total	10,350	23,000

At this point, both the North and South zones are split into "Interior" and "Amenity" areas, as in the "With Northern Crossing" scenario. This split results in the following figures:

North	Trend	Accelerated
Amenity	909	2020
Interior	3231	7180
South		
Amenity	5239	9979
Interior	971	3821

There is one exception in the Amenity/Interior split when compared to the "With Northern Crossing" scenario, however, because the total build-out increment of the South Amenity Zones is 11,681 du, a factor of 140% applied to these zones brings the area to 99% of build-out. For this reason, a factor of 120% was used instead in order to provide a more realistic growth scenario for these zones.

Once these allocations were made, the same process is used as in the "With Northern Crossing" scenario to allocate units to each zone, with the existing units added at the end to provide the final allocation for each scenario.

Employment Development

[text to come]

GLOUCESTER COUNTY
BUILD OUT – 2050 OR 2100

Zone	DU's	Population	Employees
278	1,089	2,657	
306	147	359	
307	5,527	13,486	
308	380	927	
309	1,506	3,675	
310	5,835	14,237	
311	1,061	2,589	
312	1,427	3,482	
313	284	693	
314	238	581	
315	222	542	
325	73	178	
325	759	1,852	
327	3,040	7,418	
328	2,339	5,707	
329	132	322	
330	948	2,313	
331	3,028	7,388	
332	301	734	
333	1,639	3,999	
334	507	1,237	
335	1,697	4,141	
336	1,773	4,326	
337	159	388	
338	1,179	2,877	
339	209	510	
340	1,432	3,494	
341	4,558	11,122	
342	975	2,379	
343	1,862	4,543	
344	545	1,330	
345	1,242	3,030	
346	509	1,242	
347	533	1,301	
433	1,643	4,009	
435	277	676	
436	1,773	4,326	
437	272	664	
438	9,311	22,719	
439	145	354	
441	378	922	
442	4,905	11,968	
443	6,275	15,311	
444	4,488	10,951	
445	1,941	4,736	
446	1,717	4,189	
447	3,649	8,904	
TOTAL	**83,929**	**204,787**	

GLOUCESTER COUNTY
TREND GROWTH – 2015

Zone	With Northern Crossing			Without Northern Crossing		
	DU's	Population	Employees	DU's	Population	Employees
278	289	705	3,086	277	676	2960
306	216	527	20	24	59	20
307	1,795	4,380	545	1,175	2,867	545
308	185	451	29	75	183	29
309	978	2,386	20	686	1,674	20
310	2,084	5,085	236	1,730	4,221	236
311	552	1,347	20	341	832	20
312	1,051	2,564	230	247	603	230
313	416	1,015	128	37	90	128
314	185	451	47	29	71	47
315	294	717	25	43	105	25
325	80	195	57	19	46	67
326	183	447	597	193	471	607
327	359	876	87	774	1,889	87
328	321	783	451	596	1,454	504
329	52	127	98	45	110	126
330	344	839	464	245	598	600
331	361	881	1,822	771	1,881	1129
332	90	220	20	106	259	20
333	71	173	98	425	1,037	126
334	124	303	87	129	315	87
335	214	522	513	433	1,057	663
336	166	405	428	452	1,103	553
337	41	100	20	24	59	20
338	105	256	376	484	1,181	477
339	159	388	20	34	83	20
340	206	503	20	386	942	20
341	590	1,440	1,204	1,163	2,838	1368
342	72	176	595	401	978	762
343	179	437	548	765	1,867	681
344	89	217	20	186	454	20
345	402	981	243	876	2,137	275
346	1,235	3,013	1,311	359	876	1471
347	199	486	400	136	332	274
433	1,010	2,464	926	1,158	2,826	1113
435	578	1,410	1,298	195	476	1431
436	821	2,003	87	1,250	3,050	87
437	866	2,113	476	122	298	476
438	1,122	2,738	132	6,565	16,019	132
439	352	859	20	65	159	20
441	391	954	20	170	415	20
442	833	2,033	87	1,698	4,143	87
443	737	1,798	803	2,578	6,290	959
444	813	1,984	87	3,182	7,764	87
445	742	1,810	20	1,596	3,894	20
446	559	1,364	1,344	432	1,054	508
447	385	939	87	1,675	4,087	87
TOTAL	**22,896**	**55,866**	**19,252**	**34,352**	**83,819**	**19,244**

GLOUCESTER COUNTY
ACCELERATED GROWTH – 2015

Zone	With Northern Crossing			Without Northern Crossing		
	DU's	Population	Employees	DU's	Population	Employees
278	432	1,054	3,708	471	1,149	3,124
306	273	666	4	49	120	47
307	3,106	7,579	572	1724	4,207	572
308	211	515	56	114	278	56
309	1,316	3,211	47	852	2,079	47
310	3,820	9,321	263	2297	5,605	263
311	661	1,613	47	432	1,054	47
312	1,153	2,813	257	485	1,183	257
313	146	356	155	68	166	155
314	122	298	74	55	134	74
315	180	439	52	79	193	52
325	28	68	108	25	61	122
326	285	695	648	264	644	662
327	1,211	2,955	200	1060	2,586	200
328	932	2,274	731	816	1,991	810
329	84	205	234	56	137	271
330	471	1,149	1,110	333	813	1,287
331	1,206	2,943	4,267	1056	2,577	3,308
332	193	471	47	131	320	47
333	429	1,047	234	579	1,413	271
334	202	493	200	177	432	200
335	676	1,649	1,026	592	1,444	1,695
336	706	1,723	1,022	618	1,508	1,422
337	81	198	47	81	198	47
338	597	1,457	859	778	1,898	993
339	108	264	47	108	264	47
340	407	993	47	518	1,264	47
341	1,184	2,889	1,985	1591	3,882	2,201
342	494	1,205	1,386	644	1,571	1,603
343	944	2,303	1,185	1230	3,001	1,360
344	167	407	47	338	825	47
345	861	2,101	396	1145	2,794	438
346	353	861	2,075	469	1,144	2,286
347	213	520	1,022	186	454	438
433	1,139	2,779	1,817	1515	3,697	2,063
435	192	468	1,935	255	622	2,110
436	1,229	2,999	200	1635	3,989	200
437	218	532	503	232	566	503
438	6,455	15,750	159	8585	20,947	159
439	116	283	47	235	573	47
441	303	739	47	434	1,059	47
442	1,791	4,370	200	2345	5,722	200
443	3,180	7,759	1,543	4144	10,111	1,745
444	1,455	3,550	200	4143	10,109	200
445	1,816	4,431	200	1850	4,514	200
446	779	1,901	1,307	594	1,449	1,097
447	707	1,725	200	1924	4,695	200
TOTAL	**42,632**	**104,022**	**32,516**	**47,312**	**115,441**	**33,267**

EMPLOYMENT PROJECTIONS

* = Indicates that Total Number Has Changed

THESE ARE ONLY ONES CORRECTED:

TREND GROWTH 2015 W/ N. CROSSING

TZ	GOV'T	MFG	MISC	OFF/SERV.	RETAIL	TOTAL
Strip	5%	5%	10%	45%	35%	100%
326	2	2	25	530	38	597
328	14	14	75	163	185	451
341	198	67	101	466	172	1004*
345	22	22	44	62	293	443*
346	31	44	283	453	500	1311
433	58	97	209	426	136	926
443	27	36	189	310	250	803
Mfg.	0%	70%	15%	10%	5%	100%
446	0	773	377	215	66	1431
Downtown	45%	0%	5%	30%	20%	100%
278	1784	68	273	426	535	3086
347	115	0	42	186	57	400
Rural DD	0%	0%	2%	30%	68%	100%
327	0	0	1	70	16	87
446	0	0	213	130	69	412
Rural	0%	5%	5%	35%	55%	100%
307	52	90	97	261	45	545
310	0	1	17	200	18	236
312	0	3	199	14	14	230
313	0	1	82	7	38	128
437	0	42	412	8	14	476
438	0	1	1	73	57	132

* = Indicates that Total Number Has Changed

THESE ARE ONLY ONES CORRECTED:

TREND GROWTH 2015 W/O N. CROSSING

TZ	GOV'T	MFG	MISC	OFF/SERV.	RETAIL	TOTAL
Strip	5%	5%	10%	45%	35%	100%
326	2	23	4	536	47	607
341	220	99	152	622	275	1368
345	6	6	12	116	335	475*
346	29	42	279	436	485	1271*
433	41	82	203	486	301	1113
443	34	43	204	373	305	959
Mfg.	0%	70%	15%	10%	5%	100%
446	0	255	266	141	29	691
Downtown	45%	0%	5%	30%	20%	100%
278	1728	68	267	387	510	2960
347	58	0	35	149	32	274
Rural DD	0%	0%	2%	30%	68%	100%
327	0	0	1	70	16	87
Rural	0%	5%	5%	35%	55%	100%
307	52	90	97	261	45	545
310	0	1	17	200	18	236
312	0	3	199	14	14	230
313	0	1	82	7	38	128
437	0	42	412	8	14	476
438	0	1	1	73	57	132

* = Indicates that Total Number Has Changed

THESE ARE ONLY ONES CORRECTED:

ACCELERATED GROWTH - 2015 W/ N. CROSSING

TZ	GOV'T	MFG	MISC	OFF/SERV.	RETAIL	TOTAL
Strip	5%	5%	10%	45%	35%	100%
326	4	25	9	554	56	648
341	247	126	209	907	496	1985
345	3	2	5	79	307	396
346	28	46	285	453	499	1311
433	32	73	184	402	235	926
Mfg.	0%	70%	15%	10%	5%	100%
446	0	1275	484	286	102	2147
Downtown	45%	0%	5%	30%	20%	100%
278	1802	68	275	437	542	3124
347	131	0	44	198	65	438
Rural DD	0%	0%	2%	30%	68%	100%
327	0	0	3	104	93	200
Rural	0%	5%	5%	35%	55%	100%
307	52	92	98	270	60	572
310	0	3	18	209	33	263
312	0	4	203	21	29	257
313	0	3	83	16	53	155
437	0	43	412	19	29	503
438	0	3	3	81	72	159

* = Indicates that Total Number Has Changed

THESE ARE ONLY ONES CORRECTED:

ACCELERATED GROWTH - 2015 W/O N. CROSSING

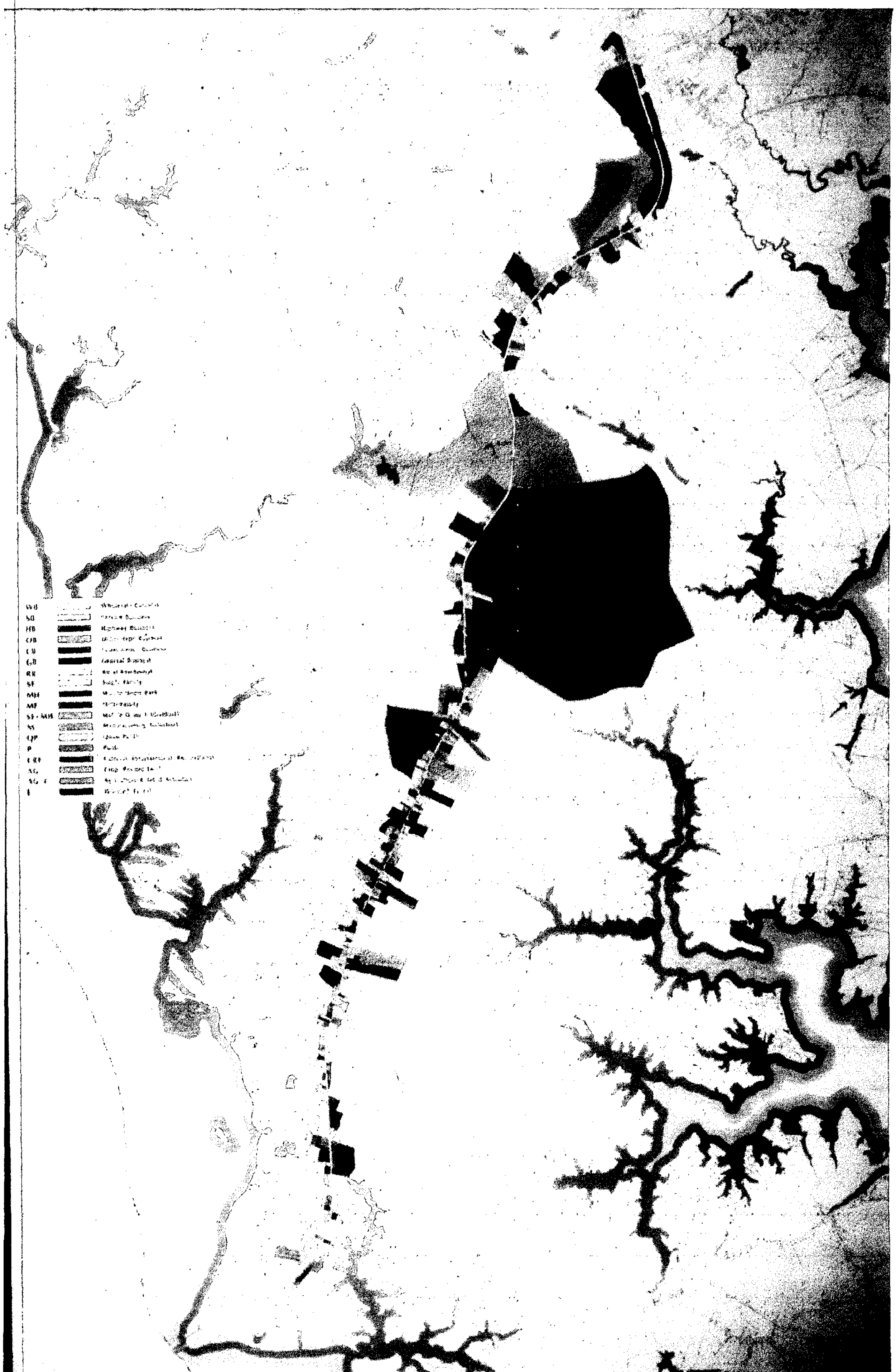
TZ	GOV'T	MFG	MISC	OFF/SERV.	RETAIL	TOTAL
Strip	5%	5%	10%	45%	35%	100%
326	5	26	10	560	61	662
341	260	136	231	1002	572	2201
345	5	5	10	97	321	438
Mfg.	0%	70%	15%	10%	5%	100%
446	0	539	327	181	50	1097
Downtown	45%	0%	5%	30%	20%	100%
278	1802	68	275	437	542	3124
347	131	0	44	198	65	438
Rural DD	0%	0%	2%	30%	68%	100%
327	0	0	3	104	93	200
Rural	0%	5%	5%	35%	55%	100%
307	52	92	98	270	60	572
310	0	3	18	209	33	263
312	0	4	203	21	29	257
313	0	3	83	16	53	155
437	0	43	412	19	29	503
438	0	3	3	81	72	159

* = Indicates that Total Number Has Changed

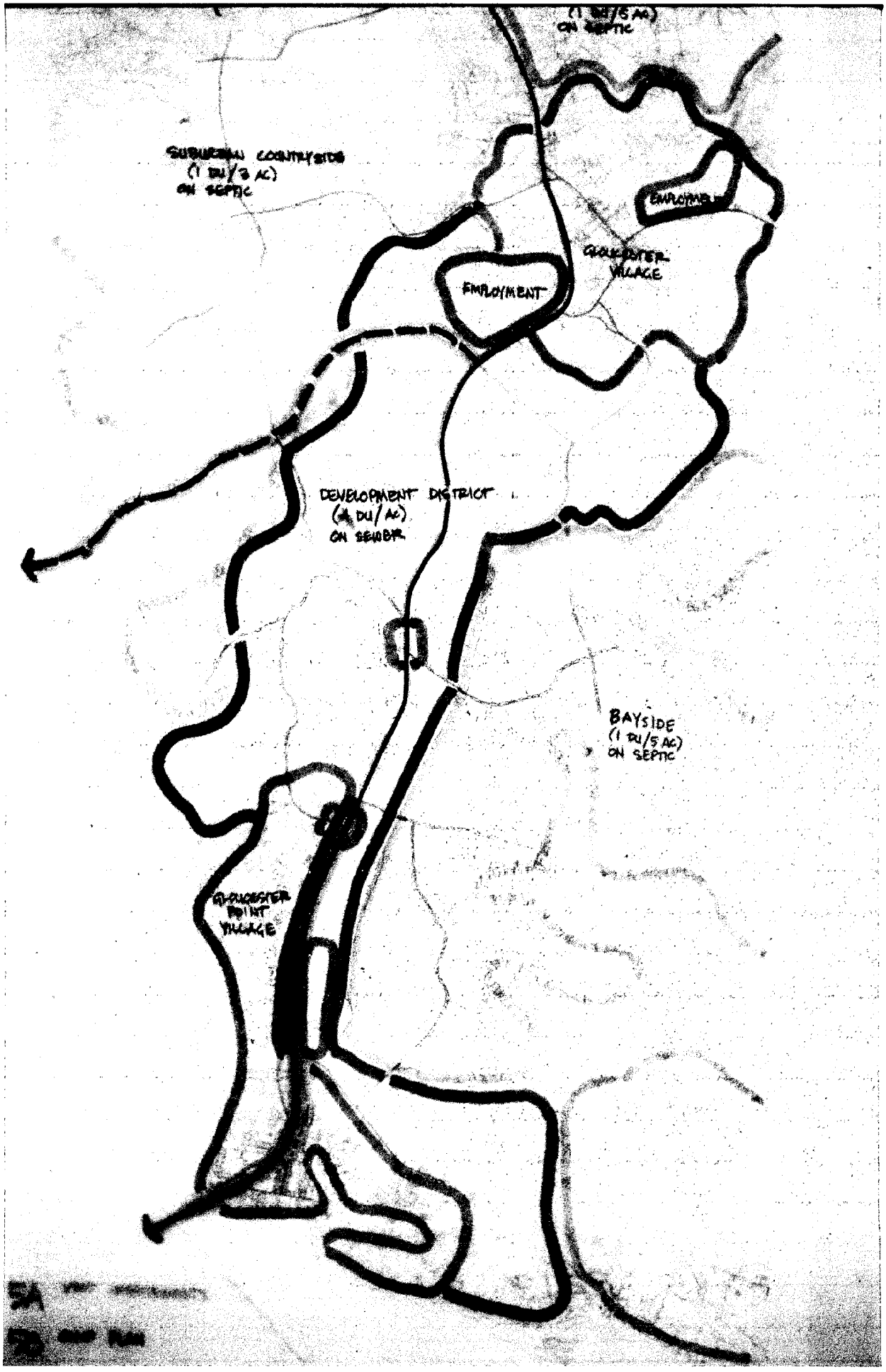
THESE ARE ONLY ONES CORRECTED:

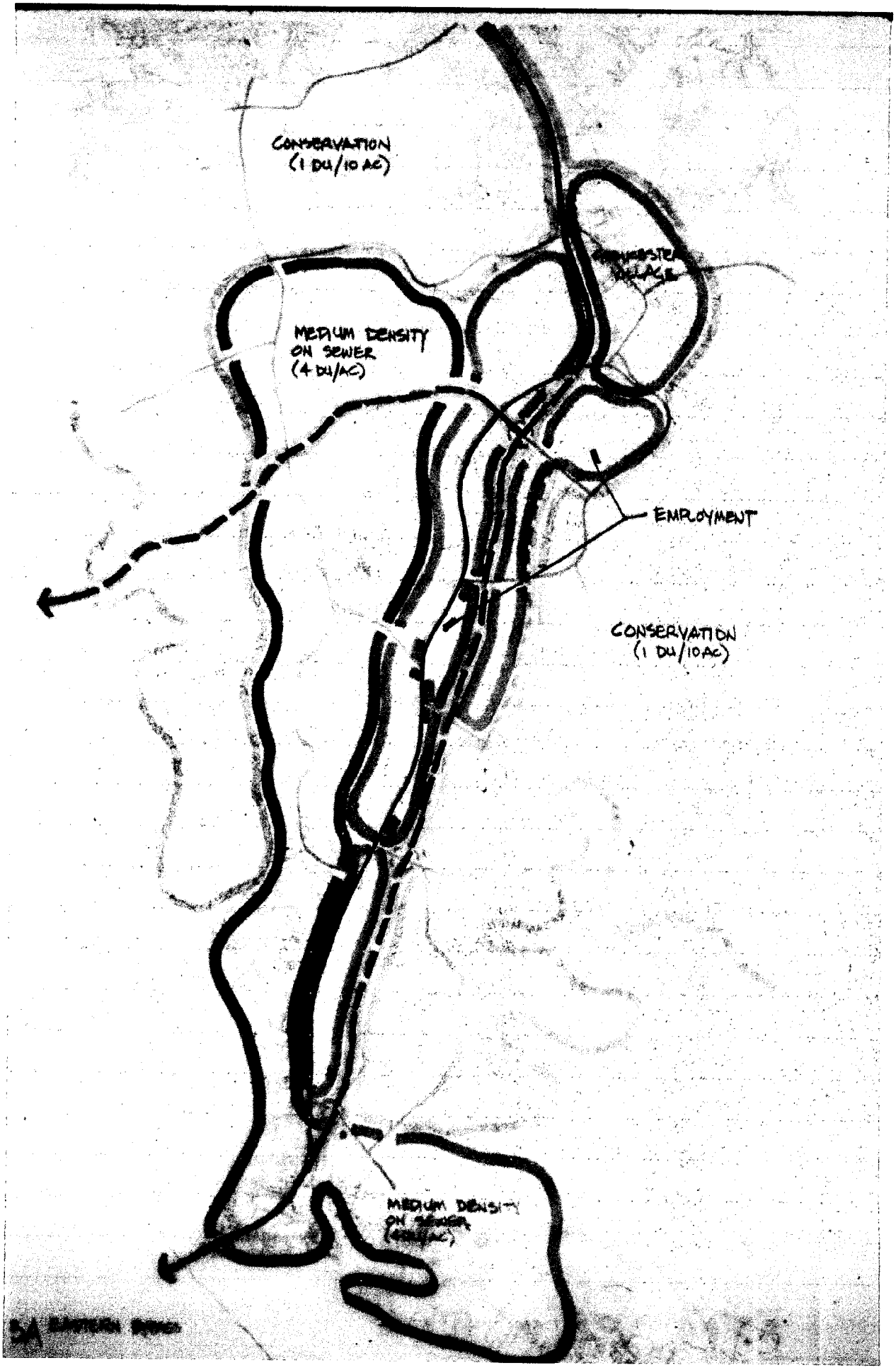
BUILDOUT

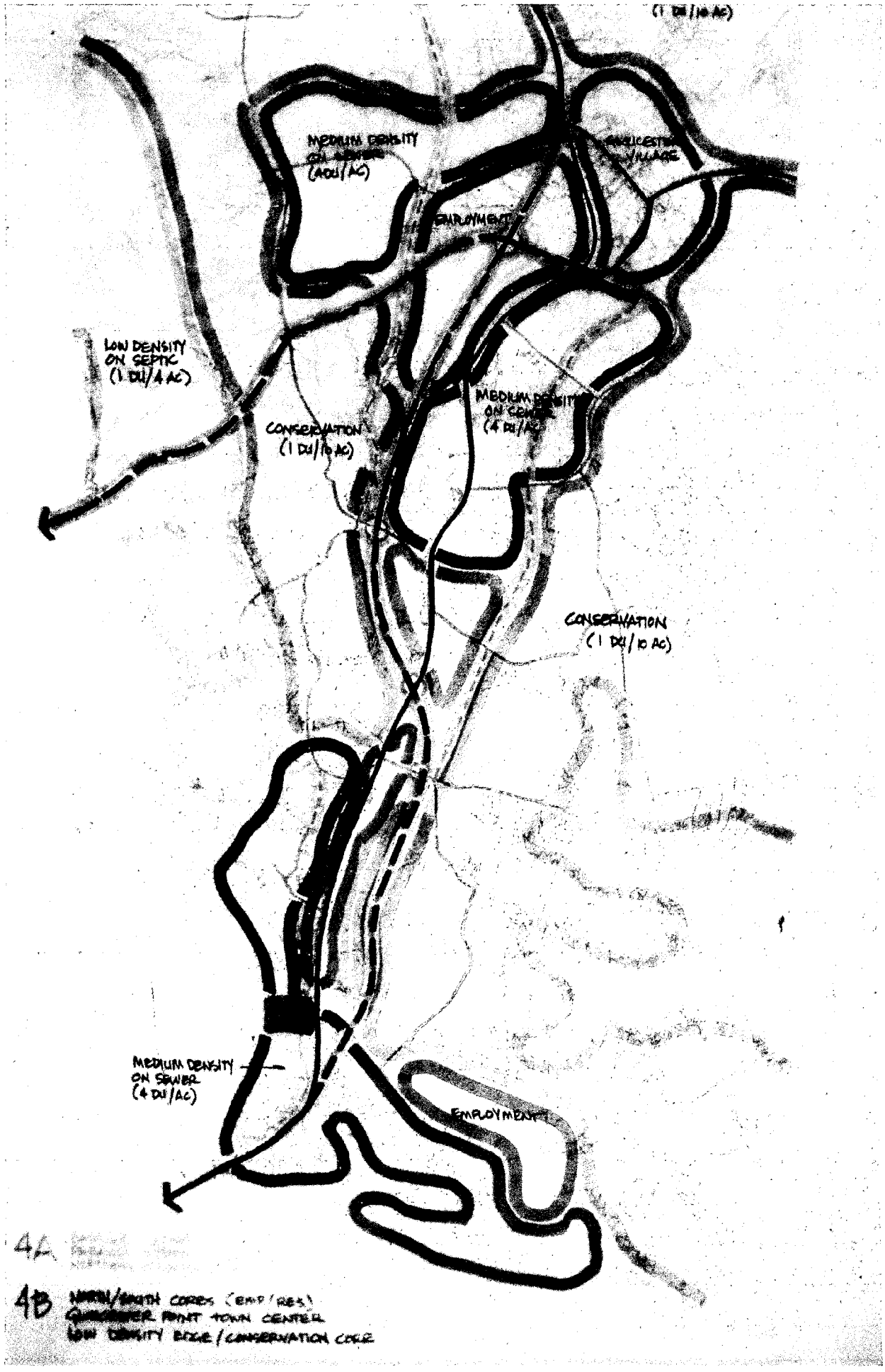
TZ	GOV'T	MFG	MISC	OFF/SERV.	RETAIL	TOTAL
Strip	5%	5%	10%	45%	35%	100%
341	229	108	182	818	427	1764
345	5	5	10	100	321	441
346	51	64	326	662	661	1764
443	52	62	242	535	432	1323
Downtown	45%	0%	5%	30%	20%	100%
278	1852	68	306	388	586	3200*
347	149	0	45	209	71	474*
Rural	0%	5%	2%	30%	68%	100%
307	52	94	88	361	272	867
310	0	0	19	238	110	367
312	0	0	199	54	114	367
313	0	0	86	78	203	367
437	0	40	415	80	182	717


WB
SB
HB
Highway Business
OB
CB
GB
General Business
RR
SF
MH
MF
SF+MH
SS
OP
P
CRF
AG
AG-F
F

Business
Residential
Manufacturing
Institutional
Conservation

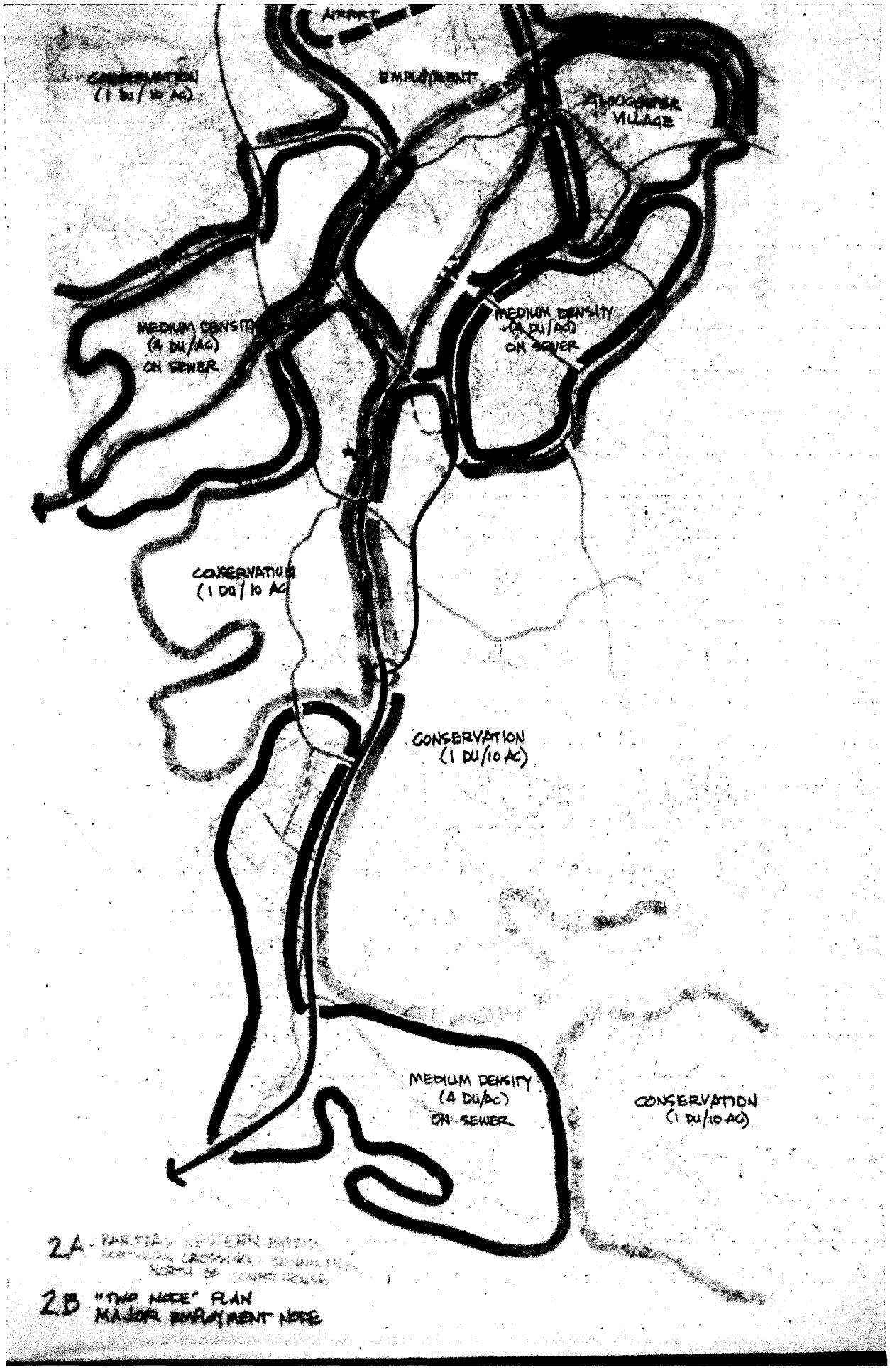

(1 DU/5 AC)
ON SEPTIC
SUBURBAN COUNTRYSIDE
(1 DU/3 AC)
ON SEPTIC
EMPLOYMENT
GLOUCESTER
VILLAGE
EMPLOYMENT
DEVELOPMENT DISTRICT
(4 DU/AC)
ON SEWER
BAYSIDE
(1 DU/5 AC)
ON SEPTIC
GLOUCESTER
POINT
VILLAGE


CONSERVATION
(1 DU/10 AC)
MEDIUM DENSITY
ON SEWER
(4 DU/AC)
EMPLOYMENT
CONSERVATION
(1 DU/10AC)



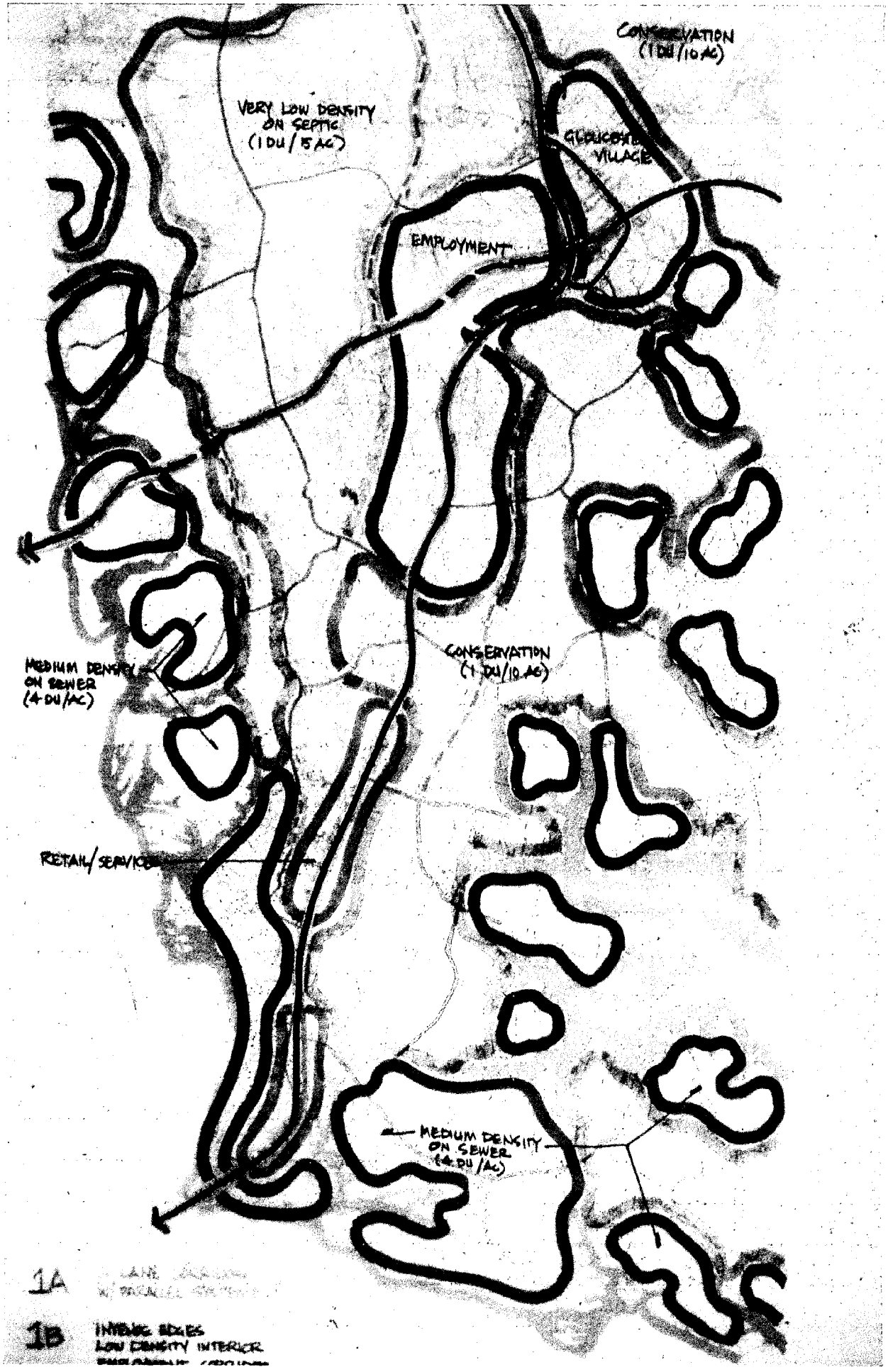
4A

4B NORTH/SOUTH CORES (EMP/RES)
QUARRYVIEW POINT TOWN CENTER
LOW DENSITY RESE/CONSERVATION CORE



2A - PARTIAL WESTERN BYPASS
NORTH OF COURTHOUSE

2B "TWO NODE" PLAN
MAJOR EMPLOYMENT NODE


CONSERVATION
(1 DU/10 AC)
VERY LOW DENSITY
ON SEPTIC
(1 DU/5 AC)
EMPLOYMENT
CONSERVATION
(1 DU/10 AC)
MEDIUM DENSITY
ON SEWER
(4 DU/AC)
RETAIL/SERVICES
MEDIUM DENSITY
ON SEWER
(4 DU/AC)
1A
1B

IV. WATER RESOURCE & PUBLIC FACILITY PLANNING

In the process of finalizing and adopting Gloucester County's 1991 Comprehensive Plan, it became clear that the transportation section lacked the detail necessary to help implement the Plan's ambitious goals. Quite simply, the land use debate had occupied most of the planning team's time, and transportation did not receive the attention it warranted. This is not to criticize the team's effort; they prioritized the land use issue at a time when frantic growth necessitated responsible land use policies. Lacking the time required to complete a detailed transportation plan, the team developed a skeletal framework of much needed, large scale improvements. In this context, planners decided that transportation would be the focus of the first major Comprehensive Plan amendment after adoption.

The initial subject of the renewed transportation debate quickly became the issue of congestion on Route 17 at Gloucester Point. A disjointed system of local roads in the area mandates that all local traffic utilize the already burdened arterial highway. Citizens and planning staff proposed a series of local connector roads, designed to provide residents an alternative local route. As planners began to consider alternative alignments for these new roads, they noticed that certain alignments crossed natural drainage systems, in a manner which suggested use of the roads as stormwater impoundment structures. This coincidence was not forgotten as the County considered options for developing an overall Transportation Plan.

Therefore, when the County decided to hire consultants to perform a Comprehensive Stormwater Management Study, transportation (and land use, as detailed in the previous section) was built into the bargain. The connections became almost circular, and planners found it critically important to chose a consultant team with demonstrated ability to deal with all three issues. Gloucester selected a team composed of three separate firms, one with expertise in each area. This decision meant that each topic would receive the attention to detail that the project required. The approach did have certain drawbacks, however, because dealing with three firms meant that communication occasionally faltered. These problems were for the most part overcome, and the net result of the project is that transportation, land use, and stormwater management will now be treated as one issue in Gloucester County.

Dedication to this approach means that stormwater management concerns will factor into all of Gloucester's comprehensive planning activities. In practical terms, it means that when planning a transportation facility,

school, or other public facility, the County will consider the stormwater management opportunities that exist in the immediate area. If feasible watershed-scale management possibilities present themselves, facility design should attempt to preserve such opportunities. In this way, options will remain open, should a major facility become the most practicable management strategy in a particular watershed. This is not to imply that regional utility-sized retention basins will be constructed wherever a new road is built. It does, however, mean that where location of such a facility seems physically possible and consistent with Gloucester's overall stormwater management strategy, that opportunity should be preserved.

The planning effort detailed in this manual has put in motion a process designed to accomplish those goals. By identifying the strengths and weaknesses of the County's current Transportation Plan (with the assistance of a computer model), consultants have developed several alternative transportation scenarios which build upon the existing skeletal network. It is important to note that although the process treats public facilities planning and stormwater management planning as inextricably linked, facility siting has come first. The reasons for this become obvious when one considers the factors which drive the process.

The designation of public facility locations and right of way corridors is one of the strongest planning tools available to localities. Once these locations become part of the Comprehensive Plan, they become powerful negotiating tools during development review. This fact helps explain why Gloucester hopes to preserve stormwater management opportunities at the comprehensive planning stage, and it underscores the reason why facility siting occurs prior to stormwater management consideration. Transportation corridors, for example, will be identified based on Gloucester land use goals and needs. Once planners identify a particular corridor, they can then analyze the stormwater management opportunities presented by that corridor. Corridor alteration may be necessary to utilize such opportunities, ensuring that transportation and stormwater goals are met. As these new corridors become part of the Comprehensive Plan, so will the stormwater catchment opportunities. Thus, during analysis of development proposals, siting of stormwater management facilities will carry the same weight as does siting of other public facilities.

It is too early to discuss implementation of this concept. Nonetheless, Gloucester has taken a critical first step for a rural jurisdiction

attempting to develop a Comprehensive Stormwater Management Strategy. For the strategy to prove successful, the County will have to remain committed to treating water resource planning and public facilities planning as integrated processes. As stated above, the goal is to keep options alive, and not to forego practicable stormwater catchment opportunities during the development process. As Gloucester continues to grow, this approach will become increasingly important.

DRAFT
Comprehensive Plan Amendment

Stormwater Management

Gloucester County, Virginia
March 1994

VCRMP Grant Program
FY 1992-1993

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TO BE INSERTED IN THE NATURAL RESOURCES SECTION OF THE GLOUCESTER COUNTY COMPREHENSIVE PLAN: NARRATIVE AT THE BOTTOM OF PAGE 153, IMPLEMENTATION RECOMMENDATIONS ON PAGE 174 ABOVE THE CHAPTER SUMMARY.

STORMWATER MANAGEMENT

Over the past several years, the subject of stormwater management has received increasing attention at the federal, state, and local levels. Numerous scientific investigations have identified stormwater runoff (rain that drains off of land into water) as a prime contributor to water pollution. Such studies have concluded that water draining from developed areas carries with it increased amounts of sediment and pollutants. This type of pollution, which does not originate from a single source, is called non-point source pollution, and has become the focus of environmental programs aimed at protecting and improving water resources. Whereas past stormwater programs sought to control only the quantity of runoff, recent initiatives have attempted to address water quality as well.

As Gloucester County continues to grow, managing the quality and quantity of stormwater runoff will prove increasingly important...and increasingly difficult. This Plan seeks to concentrate future development in areas where public facilities, such as sewer and water, are available, while preserving the County's rural character. This growth management strategy will ensure orderly development over the next twenty years, but it will also intensify the problems associated with stormwater runoff. As densities within the Development District increase, greater quantities of runoff, carrying higher pollutant loads, will result; effective stormwater planning thus becomes imperative. Furthermore, a comprehensive stormwater strategy will enhance Gloucester's ability to meet state and federal stormwater management mandates. Actually, stormwater management considerations are inherent in this Plan; this section will reiterate and clarify certain aspects of the Plan, and will outline the objectives of Gloucester's stormwater management strategy.

Perhaps the most significant water quality feature of the Plan is the overriding goal of preserving the natural and rural qualities of the northern and eastern portions of the County. These areas impact directly on the bulk of Gloucester's water resources, including the Beaverdam Reservoir, the Poropotank River, the Dragon Run, and the extensive wetlands of the Mobjack Bay system. By concentrating growth within the Development District, this Plan will help preserve the forests, wetlands, and riparian systems of Gloucester's rural Countryside, allowing them to perform their natural stormwater management functions (for a more complete explanation of these functions, see the wetlands and Chesapeake Bay sections of the Plan).

As for those areas where development is encouraged, this Plan anticipates the need for large scale regional or sub-watershed stormwater management devices. These facilities will become part of the system of utilities and services which make the Development District the most appropriate location for growth. All such utilities, taken together, will form Gloucester's water quality management program; by encouraging new and existing development to utilize services such as public water and sewer, the problems associated with failing septic systems and increasing groundwater withdrawals diminish. Growth management and stormwater management thus act in tandem to protect Gloucester's water resources.

Finally, this Plan treats stormwater management as a quality of life issue. Effectively managing stormwater runoff will prevent loss of life and property attributable to flooding. Also, by preserving and improving water quality within the County, Gloucester can sustain its close ties to the Chesapeake Bay system, and remain an attractive place to live.

The overall goal of Gloucester's stormwater strategy is to manage the quality and quantity of stormwater runoff in an efficient and sustainable manner. Meeting this broad goal will require the participation of a wide array of interests, including citizens, developers, County staff, and state and federal agencies. It will also involve enactment of several specific objectives. Perhaps most importantly, Gloucester's stormwater strategy will involve accounting for varying slopes, soil types, vegetative conditions, and development conditions. Each of these factors impacts significantly upon stormwater management techniques. Due to their specific nature, recognition must be given to the fact that treatment methods may vary, depending on the condition of a given watershed. Gloucester's program should allow significant flexibility, as long as baseline standards are met or exceeded.

The recognized need to treat stormwater on a watershed basis has driven the effort, now underway, to identify watershed boundaries within the Development District. Such identification is the first step toward a coordinated program which eliminates the problems associated with on-site management. Those problems, which have begun to manifest themselves in Gloucester County, include: insufficient long term maintenance; lack of adequate space and topography; insufficient soil conditions; and underestimation of off-site impacts. A watershed approach will help address these issues. Furthermore, watershed identification will facilitate efforts to locate stormwater management opportunities early in the planning process. By incorporating stormwater planning into its land use and transportation planning, the County will be able to preserve the most appropriate facility locations, and eliminate the confusion associated with "after the fact" stormwater planning.

In terms of funding methods for constructing and maintaining a system of stormwater management facilities, a wide range of options exist. These range from general fund allocations to establishment of a stormwater utility system. The utility option became available to localities through action of the General Assembly in 1991. Several localities in Hampton Roads have chosen this route to fund stormwater management operations, and it appears to be an attractive alternative. Potential difficulties exist, however, with the administration of a new utility system. Gloucester is currently investigating its options to determine the best method or combination of methods for funding a stormwater management system. The County should choose the method or methods which offer the most equitable and flexible guidelines, while ensuring a secure source of maintenance funds.

For the Comprehensive Plan to prove successful, efficient stormwater management must become an integral part of Gloucester's overall growth management strategy. As Gloucester continues to develop, and as the Development District becomes the focus of growth, managing runoff from impervious cover will become more important. Among other factors discussed throughout this document, stormwater management should become a growth management consideration. That is, growth should only be encouraged where stormwater solutions exist prior to development. This approach will help

preserve life, property, the environment, and the overall quality of life in Gloucester County.

Implementation Recommendations:

- o Adopt and/or amend development ordinances which ensure that land use intensities are guided by the adequacy of the storm drainage system to remove runoff without endangering persons, property, or the environment.
- o Identify drainage basins throughout the Development District, and identify the most appropriate stormwater management technique(s) for each.
- o Where possible, preserve stormwater management opportunities prior to development proposals.
- o Develop a Countywide stormwater management plan.
- o Investigate options for funding a stormwater management system and incorporate the findings into a stormwater management plan.
- o Establish stormwater runoff control standards for all new development to prevent increases in sediment, pollutant, and toxic loadings. These standards will serve to minimize or eliminate the need for structural stormwater management devices, and should include minimizing impervious cover, preserving open space systems, and utilizing alternative paving techniques.

DRAFT

STORMWATER MANAGEMENT ORDINANCE FOR GLOUCESTER COUNTY, VIRGINIA

This document was funded, in part, by the Virginia Department of Environmental Quality's Coastal Resources Management Program through Grant #NA27OZØ312-Ø1 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972 as amended.

January 14, 1994

SECTION 1

GENERAL PROVISIONS

1.1 STATUTORY AUTHORITY

The Stormwater Management Act, § 10.1-603 et seq. of the Code of Virginia, enables localities to prepare and adopt a stormwater management plan and implementing ordinance.

1.2 FINDINGS OF FACT

The waters and waterways within Gloucester County are at times subjected to flooding; that such flooding is a danger to the lives and property of the public; that such flooding is also a danger to the natural resources of the Gloucester County; that development tends to accentuate such flooding by increasing stormwater runoff, due to alteration of the hydrologic response of the watershed in changing from an undeveloped to a developed condition; that such increased flooding produced by the development of real property contributes increased quantities of water-borne pollutants, and tends to increase channel erosion; that such increased flooding, increased erosion, and increased pollution constitutes deterioration of the water resources of Gloucester County; and that such increased flooding, increased erosion and increased pollution can be controlled to some extent by the regulation of stormwater runoff from such development. Therefore, it is determined that it is in the public interest to establish requirements to regulate the discharge of stormwater runoff from such developments as provided in this ordinance.

1.3 PURPOSE

It is the purpose of this ordinance to establish minimum stormwater management requirements and controls:

1. To reduce flood damage to public health, life, and property;

2. To minimize increased stormwater runoff from new land development where such runoff will increase flood damage;

3. To maintain the adequacy of existing and proposed culverts and bridges, dams and other structures;

4. To prevent, to the greatest extent feasible, an increase in nonpoint source pollution;

5. To maintain the integrity of stream channels for their biological functions, as well as for drainage and other purposes;

6. To reduce the impact of development upon stream erosion; and

7. To preserve and protect water supply facilities and water resources by means of controlling increased flood discharges, stream erosion, and nonpoint source pollution.

1.4 PROGRAM ADMINISTRATION

Gloucester County designates the Director, Department of Community Development as the program administrator.

1.5 APPLICABILITY

A. Except as provided for in § 1.5.B. of this ordinance, all land development projects shall comply with the requirements of this ordinance.

B. The following activities are exempt from this ordinance:

1. Permitted surface or deep mining operations and projects, or oil and gas operations and projects conducted under the provisions of Title 45.1 of the Code of Virginia.

2. Tilling, planting or harvesting of agricultural, horticultural, or forest crops.

3. Single-family residences separately built and not part of a subdivision, including additions or modifications to existing single-family detached residential structures.

4. Land development projects that disturb less than one acre of land area. (NOTE: THIS COULD BE SMALLER OR CONTAIN CONDITIONS.)

5. State projects as defined in this ordinance.

1.6 COMPATIBILITY WITH OTHER PERMIT AND ORDINANCE REQUIREMENTS

Approvals issued pursuant to this ordinance do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act or ordinance. If more stringent requirements concerning regulation of stormwater are contained in the other code, rule, act or ordinance, the more stringent regulation shall apply. Provisions in the Chesapeake Bay Preservation Ordinance (Chapter 5.5) and Erosion and Sediment Control Ordinance (Chapter 7.5) of Gloucester County are part of this ordinance.

1.7 SEVERABILITY

If the provisions of any article, section, subsection, paragraph, subdivision or clause of this ordinance shall be judged invalid by a court of competent jurisdiction, such order or judgement shall not affect or invalidate the remainder of any article, section, subsection, paragraph, subdivision or clause of this ordinance.

SECTION 2

DEFINITIONS

Unless specifically defined below, words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application.

"Adequate channel" means a channel that will convey the designated frequency storm event without overtopping the channel banks nor causing erosive damage to the channel bed or banks.

"Applicant" means any person submitting a stormwater management plan for approval.

"Channel" means a natural stream or manmade waterway.

"County" means Gloucester County.

"Development" means a tract of land developed or to be developed as a unit under single ownership or unified control which is to be used for any business or industrial purpose or is to contain three or more residential dwelling units.

"Flooding" means a volume of water that is too great to be confined within the banks or walls of the stream, water body or conveyance system and that overflows onto adjacent lands, causing or threatening damage.

"Floodplain" means those areas adjoining a river, stream, channel, ocean, bay or lake which are likely to be covered by flooding.

"Infiltration facility" means a stormwater management facility which temporarily impounds runoff and discharges it via infiltration through the surrounding soil. While an

infiltration facility may also be equipped with an outlet structure to discharge impounded runoff, such discharge is normally reserved for overflow and other emergency conditions. Since an infiltration facility impounds runoff only temporarily, it is normally dry during non-rainfall periods.

"Inspection" means an on-site review of the project's compliance with the approved plan, the local stormwater management program, and any applicable design criteria.

"Land development" or "land development project" means a manmade change to the land surface that potentially changes its runoff characteristics.

"Local stormwater management program" or "local program" means a statement of the various methods employed by a locality to manage the runoff from land development projects and may include such items as local ordinances, policies and guidelines, technical materials, inspections, enforcement and evaluation.

"Locality" means a county, city, or town.

"Nonpoint source pollution" means pollution whose sources cannot be pinpointed but rather is washed from the land surface in a diffuse manner by stormwater runoff.

"Onsite stormwater management facilities" means facilities which are designed to control stormwater runoff emanating from a specific site.

"Person" means any individual, partnership, firm, association, joint venture, public or private corporation, trust, estate, commission, board, public or private institution, utility, cooperative, county, city, town or other political subdivision of the Commonwealth, any interstate body or any other legal entity.

"Post-development" refers to conditions that reasonably may be expected or anticipated to exist after completion of the land development activity on a specific site or tract of land.

"Pre-development" refers to the land use that exists at the time that plans for the land development are submitted to the locality. Where phased development or plan approval occurs (preliminary grading, roads and utilities, etc.), the existing land use at the time the first item is submitted shall establish pre-development conditions.

"Regional (watershed wide) stormwater management facility" or "regional facility" means a facility or series of facilities designed to control stormwater runoff from a large contributing area, although only portions of the watershed may experience land development. (NOTE: SHOULD WE DEFINE "LARGE".)

"Regional stormwater management plan" or "regional plan" means a document containing material describing how runoff from open space, existing development and future planned development areas within a watershed will be controlled by coordinated design and implementation of regional stormwater management facilities.

"Runoff" or "stormwater runoff" means that portion of precipitation that is discharged across the land surface or through conveyances to one or more waterways.

"State project" means the construction of any facility or expansion of an existing facility including, but not limited to land clearing, soil movement, or land development, which is undertaken by any state agency, board, commission, authority or any branch of state government, including state supported institutions of higher learning.

"Stormwater detention basin" or "detention basin" means a stormwater management facility which temporarily impounds runoff and discharges it through a hydraulic outlet structure to a downstream conveyance system. While a certain amount of outflow may also occur via infiltration through the surrounding soil, such amounts are negligible when compared to the outlet structure discharge rates and are, therefore, not considered in the facility's design. Since a detention facility impounds runoff only temporarily, it is normally dry during non-rainfall periods.

"Stormwater management facility" means a device that controls stormwater runoff and changes the characteristics of that runoff including, but not limited to, the quantity and quality, the period of release or the velocity of flow.

"Stormwater management plan" or "plan" means a document containing material for describing how existing runoff characteristics will be maintained by a land development project and comply with the requirements of this ordinance.

"Stormwater retention basin" or "retention basin" means a stormwater management facility which, similar to a detention basin, temporarily impounds runoff and discharges its outflow through a hydraulic outlet structure to a downstream conveyance system. Unlike a detention basin, however, a retention basin also includes a permanent impoundment and, therefore, is normally wet, even during non-rainfall periods. Storm runoff inflows are temporarily stored above this permanent impoundment.

"Subdivision" means the division of a parcel of land into three or more lots or parcels of less than five acres each for the purpose of transfer of ownership or building development, or, if a new street is involved in such division, any division of a parcel of land. The term includes resubdivision and, when appropriate to the context, shall relate to the process of subdividing or to the land subdivided.

"Water quality volume" means the volume equal to the first 0.5 inch of runoff multiplied by the total impervious area of the land development project.

"Watershed" means the total drainage area contributing runoff to a single point.

SECTION 3

TECHNICAL CRITERIA

Each proposed land development project not exempted from this ordinance as provided in § 1.5.B shall meet the following stormwater management criteria.

3.1 QUANTITY CONTROL

A. A stormwater management plan for a land development project shall be developed so that from the site, the post-development peak runoff rates from a two-year storm and a 10-year storm, considered individually, shall not exceed their respective pre-development rates.

B. These design storms shall be defined as either a 24-hour storm using the rainfall distribution recommended by the U.S. Soil Conservation Service when using U.S. Soil Conservation Service methods or as the storm of critical duration that produces the greatest required storage volume at the site when using a design method such as the Rational Method.

C. For purposes of computing runoff, all lands in the site shall be assumed prior to development to be in good condition (if the lands are pastures, lawns, or parks), with good cover (if the lands are woods), or with conservation treatment (if the lands are cultivated); regardless of conditions existing at the time of computation.

3.2 QUALITY CONTROL

In order to enhance water quality of stormwater runoff, all stormwater management plans must provide for the control of the water quality volume. The water quality volume shall be treated by one of the following methods.

A. For a detention basin, the water quality volume shall be detained and released over 30 hours.

1. The detention time is a brim-drawdown time and therefore, shall begin at the time of peak storage of the water quality volume in the detention basin.

2. If the above requirement would result in an outlet opening smaller than three inches in diameter or the equivalent cross sectional area, the period of detention shall be waived so that three inches will be the minimum outlet opening used.

(NOTE: THESE CRITERIA ARE CURRENTLY BEING REVISED BY THE STATE.)

B. For a retention basin, the volume of the permanent pool must be at least three times greater than the water quality volume. The shape of the pond shall be to avoid short-circuiting by maximizing the distance between the pond inlet(s) and outlet. Length to width ratio of 3:1 or greater shall be provided.

C. For an infiltration facility, the water quality volume must be completely infiltrated within 48 hours.

1. The invert of the infiltration facility must be at least four feet above the seasonal high groundwater elevation or continuous clay lens.

2. A detailed soils analysis and report shall be required at the location of the infiltration facility. The report shall contain adequate information to demonstrate that the infiltration facility is feasible.

3. Approvals will be on a case-by-case basis after technical review by the County. The objective of this review will be to avoid groundwater contamination and verify adequate operation of the infiltration facility.

D. Design calculations verifying compliance with the water quality requirements shall be submitted.

3.3 REGIONAL STORMWATER MANAGEMENT

If a regional stormwater management plan prepared in accordance with the State Stormwater Management Regulations, has been adopted by the County for the watershed in which the proposed land development is located, the applicant shall comply with the requirements of the regional watershed plan.

3.4 GENERAL CRITERIA

A. Proposed residential, commercial, or industrial subdivisions shall apply these stormwater management criteria to the land development as a whole. Individual lots in new subdivisions shall not be considered separate land development projects, but rather the entire subdivision shall be considered a single land development project. Hydrologic parameters shall reflect the ultimate land development and shall be used in all engineering calculations.

B. Construction of stormwater management facilities or modifications to channels shall comply with all applicable laws and regulations. Evidence of approval of all necessary permits shall be presented at the time application for the land disturbance permit is made.

C. Pre-development and post-development runoff rates shall be verified by calculations that are consistent with good engineering practices and that are acceptable to the County. Calculation procedures are contained in TR-20 and TR-55 manuals.

D. The design of impounding structures that are not covered by the Virginia Dam Safety Regulations shall be checked by the applicant for structural integrity and floodplain impacts for the 100-year storm event.

E. Outflows from a stormwater management facility shall be discharged to an adequate channel, or velocity dissipators shall be placed at the outfall of all detention and retention basins and along the length of any outfall channel as necessary to provide a non-erosive velocity of flow from the basin to a channel.

F. Land development projects must comply with the Virginia Erosion and Sediment Control Act and attendant regulations.

G. Safety measures should be incorporated into the design of all stormwater management facilities. These may include but are not limited to, safety ledges, fencing, warning signs, anti-vortex devices, staff gages indicating depth at the lowest point, and outlet structures designed to limit public access.

H. If stormwater management facilities are provided through which water passes at times other than following rainfall, the County Engineer shall be consulted concerning design criteria. It is necessary for detention requirements to be met, despite the necessity of passing certain low flows. This applies to all onstream or online stormwater management facilities.

I. Outlets from stormwater management facilities shall be designed to function without manual, electrical or mechanical controls, unless otherwise approved by the County Engineer.

J. Detention facilities shall be designed to minimize propagation of insects, particularly mosquitos.

3.5 STORMWATER MANAGEMENT FACILITIES IN FLOODPLAINS

A. New construction, including construction of onsite stormwater management facilities, should be avoided in floodplains. When this is unavoidable, a special examination to determine adequacy of proposed stormwater management facilities during the 10-year flood shall be required.

> NOTE: The purpose of this analysis is to ensure that the stormwater management facility will operate effectively and to evaluate the effect the stormwater management facility may have on the available floodplain storage. One acceptable method is to apply the 10-year design storm to both the site and to the entire watershed contributing to the floodplain, assuming that the two peak simultaneously at the point in question. The time of

concentration assumed for the entire watershed should be that appropriate to the larger area, rather than the shorter period applicable to the site.

B. In addition, such construction shall be in compliance with all applicable regulations under the National Flood Insurance Program and the County Floodplain Ordinance.

3.6 NONSTRUCTURAL MEASURES

It is not necessary that basic requirements for water quality and quantity control be satisfied solely by means of structural methods. Non-structural practices including, but not limited to, cluster land use development, minimization of impervious surface and curbing requirements, open space acquisition, floodplain management, and protection of wetlands, steep slopes and vegetation should be coordinated with structural requirements.

SECTION 4

STORMWATER MANAGEMENT PLAN REQUIREMENTS

4.1 GENERAL REQUIREMENTS

A. Except as provided for in § 1.5.B of this ordinance, no grading, building, or other permit shall be issued for land development unless a stormwater management plan has been submitted to, and approved by, the County.

B. The applicant shall demonstrate that the project meets the criteria set forth in this ordinance.

C. Failure of the applicant to demonstrate that the project meets the criteria set forth in this ordinance shall be reason to deny the applicant's underlying application for approval.

4.2 PLAN SUBMISSION

A. The applicant shall submit the material required in a stormwater management plan in accordance with § 4.3 of this ordinance.

B. Four (4) copies of the stormwater management plan shall be submitted.

C. Fee (input from County).

4.3 STORMWATER MANAGEMENT PLAN

The following information, where applicable, shall be required for each proposed project subject to review under this ordinance. Maps, plans, designs and calculations shall be certified by a professional engineer or Class III B surveyor.

A. General

1. Name, address and phone number of the person (see definition).

2. General description of the project.

3. General description of the erosion and sediment controls.

4. General description of temporary and permanent stormwater management facilities.

5. Project schedule, including a sequence of construction.

B. Maps of the project area showing:

1. The boundary of the drainage area tributary to the project site.

2. The location of the project relative to significant features in the general surroundings such as roads, pedestrian ways, access to the site, adjacent land uses, property lines, existing manmade structures, public facilities, landmarks, and places of architectural and historical significance.

3. Existing contours at 2-foot intervals, extending a minimum of 100 feet beyond the limits of the proposed development. Projects greater than 50 acres in size shall be tied into the County's survey control (monuments under GIS control).

4. Streams, lakes, ponds, existing drainage swales, wetlands, forested areas and other physical features within or adjacent to the project area.

5. Unique, unusual, or environmentally sensitive features that provide particular opportunities or constraints for development.

6. Locations of existing and proposed utilities, sewers and water lines.

7. Soil types, boundaries, and locations of areas with steep slopes or highly erodible soils.

8. Alterations in the natural terrain, cover, and grade including lawns and other landscaping.

9. Areas to be cut or filled.

10. The location of proposed buildings, roads, parking areas, and other permanent structures.

11. Final contours at 2-foot intervals, extending a minimum of 100 feet beyond the limits of the proposed development.

C. Stormwater Management Facilities

1. All stormwater management facilities must be shown on a map, including details, plan, profile, and cross sections.

2. If infiltration facilities are proposed, the locations of existing and proposed wells and septic system drain fields within 100 feet must be shown.

3. Comprehensive hydrologic and hydraulic design calculations, including all assumptions and criteria, for the pre-development and post-development conditions for the design storms specified in Section 3 of this ordinance.

4. A soils report and boring logs.

5. A maintenance plan indicating the person permanently responsible for maintenance of the stormwater management facilities and a maintenance program for the proposed stormwater management facilities.

4.4 PLAN APPROVAL

A. A maximum of 30 calendar days from the receipt of an application will be allowed for preliminary review of the application for completeness. During this period, the application will be accepted for review, which will begin the 60-day review period, or rejected for incompleteness. The applicant will be informed in writing of the information necessary to complete the application.

B. The 60-day review period begins on the day the complete stormwater management plan is accepted for review. At this time, an acknowledgement letter will be sent to the applicant. During the 60-day review period, the County shall either approve or disapprove the plan and communicate its decision to the applicant in writing. Approval or denial shall be based on the plan's compliance with this ordinance.

C. A disapproval of a plan shall contain the reasons for disapproval.

D. The applicant or any aggrieved party authorized by law may appeal the County's decision of approval or disapproval of a stormwater management plan application within 30 days after the rendering of such a decision by the County, to the circuit court of the jurisdiction in which the land development project is located.

E. Judicial review shall be on the record previously established and shall otherwise be in accordance with the provisions of the Administrative Process Act (§ 9-6.14:1 et seq. of the Code of Virginia).

4.5 CONDITIONS OF APPROVAL

Each approved stormwater management plan shall be subject to the following conditions:

1. The applicant shall comply with all applicable requirements of the approved plan and the local program and shall certify that all land clearing, construction, land development and drainage will be done according to the approved plan.

2. The land development project shall be conducted only within the area specified in the approved plan.

3. The County shall be allowed, after giving notice to the owner, occupier or operator of the land development project, to conduct periodic inspections of the project. The owner, occupier or operator shall be given the opportunity to accompany the inspector.

4. No transfer, assignment or sale of the rights granted by virtue of an approved plan shall be made unless a written notice of transfer is filed with the County and the transferee certifies agreement to comply with all obligations and conditions of the approved plan.

5. A set of certified as-built plans shall be submitted to the County upon completion of the project.

6. The person responsible for implementing the approved plan may be required to conduct monitoring and submit reports to ensure compliance with the approved plan and to determine whether the plan provides effective stormwater management.

4.6 PERFORMANCE BOND

A. All applicants shall submit to the County a performance bond with surety, cash escrow, letter of credit, or such other legal arrangement acceptable to the County's attorney, to ensure that measures could be taken by the County at the applicant's expense should the applicant fail, after proper notice, within the time specified to initiate or maintain appropriate actions which may be required of the applicant by the approved stormwater management plan.

B. If the County takes such action upon such failure by the applicant, the County may collect from the applicant the costs of such action in excess of the amount of the security held.

C. Within sixty days of the completion of the requirements of the approved stormwater management plan, the bond, cash escrow, letter of credit or other legal arrangement, or the unexpended or unobligated portion thereof, shall be refunded to the applicant or terminated.

D. These requirements are in addition to all other provisions of law relating to the issuance of such plans and are not intended to otherwise affect the requirements for such plans.

4.7 CHANGES TO AN APPROVED PLAN

No changes may be made to an approved plan without review and written approval by the Program Administrator.

4.8 EXCEPTIONS

A. A request for an exception shall be submitted, in writing, to the County. An exception from this ordinance may be granted by the Program Administrator, provided that: (i) exceptions to the criteria are the minimum necessary to afford relief, and (ii) reasonable and appropriate conditions shall be imposed as necessary upon any exception granted so that the purpose and intent of this ordinance is preserved.

B. Economic hardship is not sufficient reason to grant an exception from the requirements of this ordinance.

SECTION 5

FEES

(NOTE: OPTIONAL. ALSO TO SET AMOUNTS.)

A plan review and inspection fee shall be paid to the County at the time of submission of the stormwater management plan as follows:

1. $_____ for each 10,000 square feet to be graded or developed as part of the project.

or

1. $_____ for each hour of review time.

2. This fee is an approximation of the estimated cost to the County to have its professional staff or consultants review the proposed project.

NOTE: A locality may charge applicants a reasonable fee to defray the costs of program administration, including costs associated with plan review, issuance of permits, periodic inspection for compliance with approved plans and necessary enforcement, provided that charges for such costs are not made under any other law, ordinance or program. The fee shall not exceed an amount commensurate with the services rendered and expenses incurred or the amount established in § 10.1-603.10 of the Code of Virginia, whichever is less. The maximum fee established in the Code of Virginia is $1000.

SECTION 6

CONSTRUCTION INSPECTIONS

A. The County's engineer or designee shall make regular inspections during all phases of construction of the stormwater management facilities.

B. The applicant shall notify the County 24 hours prior to the commencement of any activity covered by this ordinance so that appropriate inspections can be made to insure compliance with this ordinance.

C. Inspection reports shall be maintained as part of the land development project file.

****

OPTIONAL: A more detailed construction inspection section might contain the following.

CONSTRUCTION INSPECTIONS

A. The County's engineer or designee shall inspect all phases of development of the site including, but not limited to:

1. Completion of preliminary site preparation including stripping of vegetation, stockpiling of topsoil, and construction of temporary stormwater management facilities.

2. Completion of rough grading, but prior to placing top soil, permanent drainage or other site development improvements and ground covers.

3. Regular inspections during construction of the permanent stormwater management facilities at the following specified stages of construction. (NOTE: LEAVE OUT ANY FACILITIES NOT ACCEPTABLE TO COUNTY).

a. Infiltration facilities

i. Completion of excavation;

ii. Construction of the embankment (infiltration basins);

iii. Installation of filter fabric;

iv. Placement of aggregate;

v. Installation of observation well;

vi. Completion of surface layer; and

vii. Final stabilization.

b. Porous pavement facilities

i. Completion of the subgrade section;

ii. Placement of the aggregate base course;

iii. Placement of the aggregate filter course; and

iv. Placement of the porous asphaltic concrete surface course to ensure proper laying temperatures and compaction.

c. Vegetated swales

i. Completion of excavation;

ii. Construction of check dams; and

iii. Final stabilization.

d. Detention and retention facilities

i. Completion of excavation to subfoundation and when required, installation of structural supports or reinforcement for structures, including but not limited to:

* Core trenches for structural embankments,

* Inlet and outlet structures, anti-seep structures, watertight connections on pipes, and

* Trenches for enclosed storm drainage facilities.

ii. Placement of structural fill and concrete and installation of piping and catch basins;

iii. Backfill of foundations and trenches;

iv. Construction of the embankment; and

v. Final stabilization.

4. Upon completion of any final grading, vegetative control measures or other site restoration work done in accordance with the approved plan.

B. No work shall begin on a subsequent stage until the preceding stage has been inspected and approved by the County Engineer.

C. The applicant shall notify the County 24 hours prior to the commencement of any activity covered by this ordinance so that appropriate inspections can be made to insure compliance with this ordinance.

D. Any portion of the approved plan which does not comply with the approved plan must be corrected by the applicant within 24 hours. No work may proceed on any subsequent phase of the stormwater management plan, the subdivision or land development or building construction until the required corrections have been made.

E. If at any stage of the work, the County's engineer determines that the soil or other conditions are not as stated or shown in the approved application, the County's engineer may refuse to approve further work and the County may revoke existing permits or approvals until a revised plan is submitted and approved.

F. Inspection reports shall be maintained as part of the land development project file.

SECTION 7

MAINTENANCE

A. Responsibility for the operation and maintenance of stormwater management facilities, unless assumed by a governmental agency, shall remain with the property owner and shall pass to any successor or owner. If portions of the land are to be sold, legally binding arrangements shall be made to pass the basic responsibility to successors in title. These arrangements shall designate for each parcel the property owner, governmental agency, or other legally established entity to be permanently responsible for maintenance.

B. In the case of developments where lots are to be sold, permanent arrangements satisfactory to the County's attorney shall be made to insure continued performance of these obligations.

C. In the event that the stormwater management facilities are in need of maintenance or become a danger to public safety or public health, the responsible person shall be notified in writing, advised of the corrective measures required, and given a reasonable period of time to take necessary action. If the responsible person fails or refuses to perform such maintenance and repair, the County has the authority to perform the work and to recover the costs from the responsible person. (NOTE: PROPERTY OWNER?)

D. To ensure proper performance of the stormwater management facility between scheduled maintenance operations, the owner is responsible for inspecting the stormwater management facility on a semi-annual basis and after any storm which causes the capacity of the facility to be exceeded.

E. Right of entry agreements or easements may be required from the applicant for purposes of inspection and maintenance by the County Engineer or his designee.

SECTION 8

ENFORCEMENT

A. If it is determined that there is a failure to comply with the approved plan, notice shall be served upon the applicant or person responsible for implementing the plan by registered or certified mail to the address specified in the application or plan certification, or by delivery at the land development site to the agent or employee supervising such activities.

B. The notice shall specify the measures needed to comply with the plan and shall specify the time within which such measures shall be completed.

C. Upon failure to comply within the time specified, the permit or approval may be revoked and the applicant or person responsible for implementing the plan shall be deemed to be in violation of this ordinance.

D. Any person who violates any provision of this ordinance shall be guilty of a **misdemeanor** (?) and shall be subject to a fine or imprisonment for each violation, or both, as provided for in § 10.1-603.14 of the Code of Virginia.

E. The program administrator may apply to the circuit court to enjoin a violation or a threatened violation of this ordinance as provided for in § 10.1-603.14 of the Code of Virginia without the necessity of showing that an adequate remedy at law does not exist.

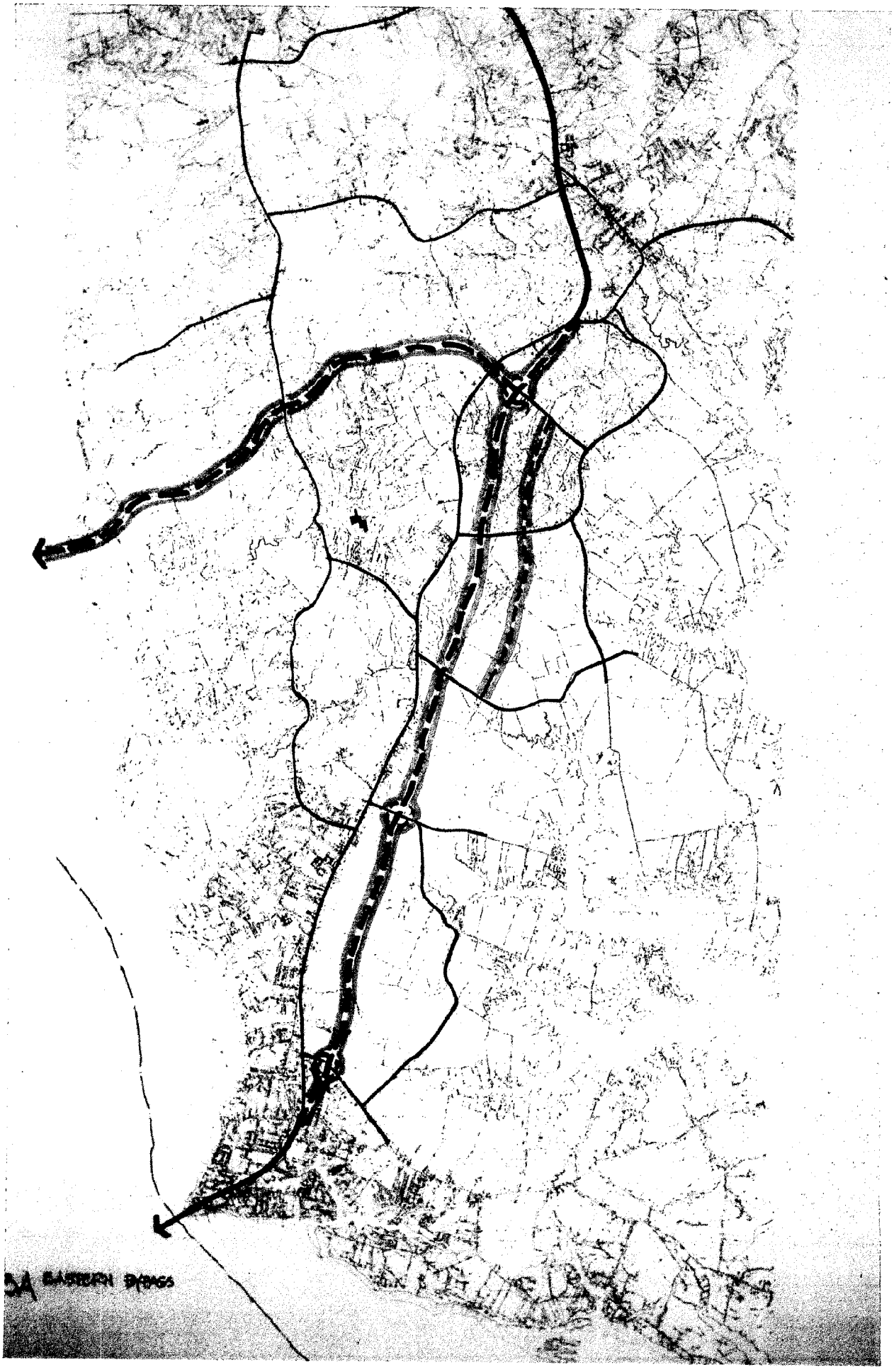
F. Without limiting the remedies which may be obtained in this section, the program administrator may bring a civil action against any person for violation of this ordinance, or any condition of the permit or approval, or any provision of the local program. The action may seek to impose of a civil penalty of not more than $2000 for <u>each violation</u> as provided for in § 10.1-604.14 of the Code of Virginia.

G. With the consent of any person who has violated or failed, neglected or refused to obey this ordinance or any condition of the permit or approval or any provision of the local program, the program administrator may issue an order against or to such person, for the payment of civil charges for violations in specific sums, not to exceed the limit specified in subsection F of this section as provided for in § 10.1-604.14 of the Code of Virginia. Such civil charges shall be instead of any appropriate civil penalty which could be imposed under subsection F.

SECTION 9

EFFECTIVE DATE

This ordinance shall take effect upon final passage and approval by the County.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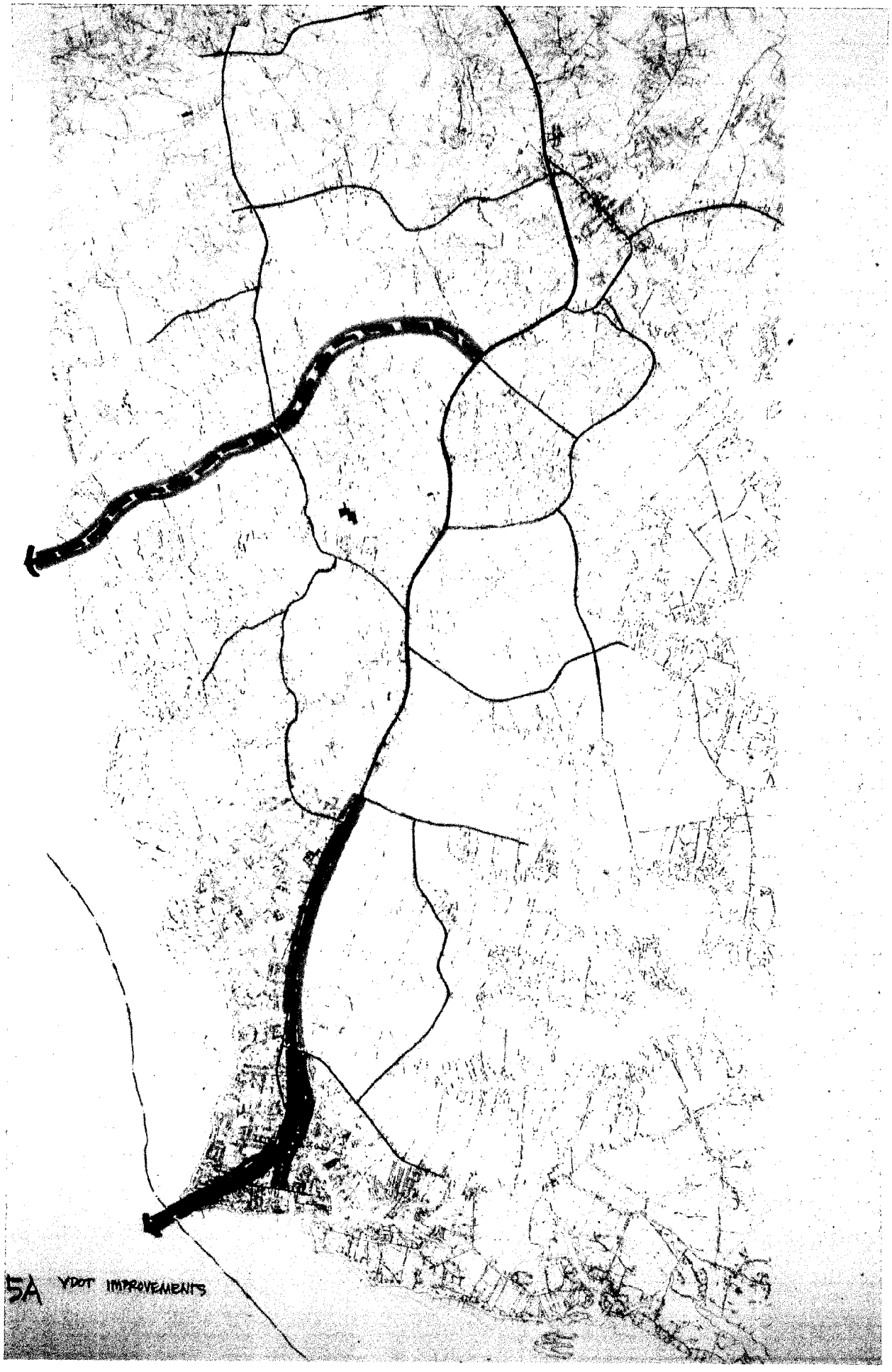

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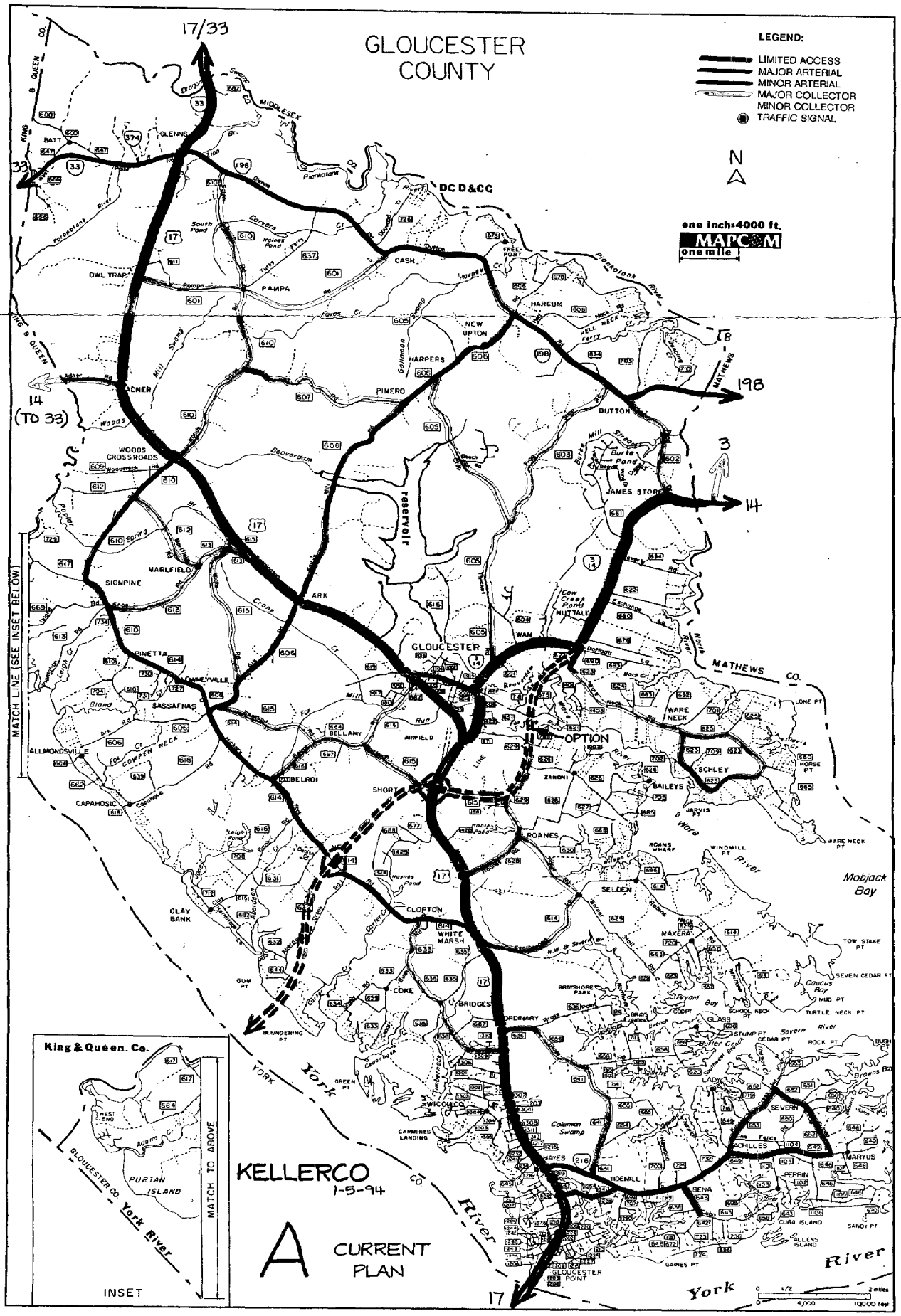
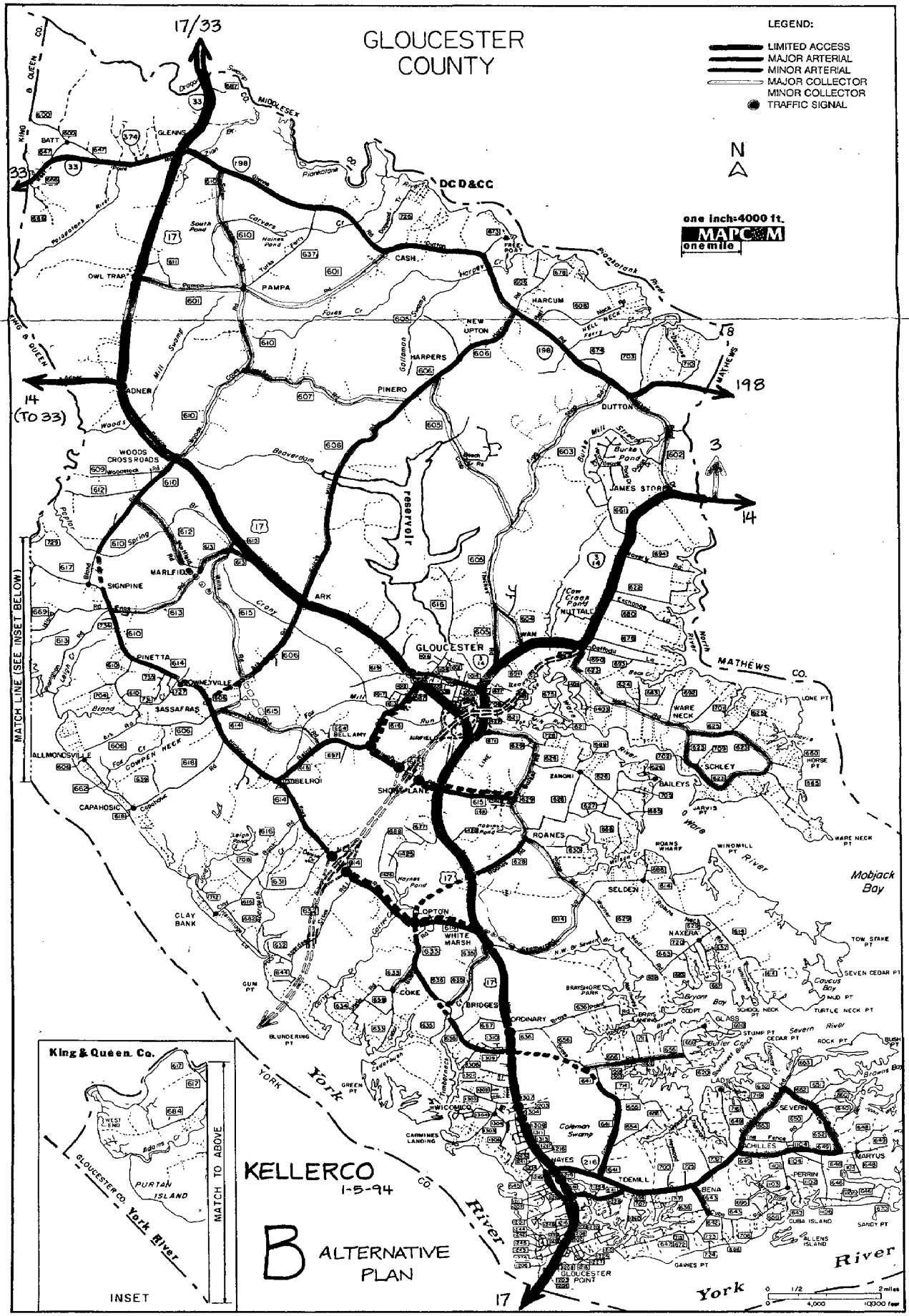

GLOUCESTER COUNTY
LEGEND:
LIMITED ACCESS
MAJOR ARTERIAL
MINOR ARTERIAL
MAJOR COLLECTOR
MINOR COLLECTOR
TRAFFIC SIGNAL
N
one inch=4000 ft.
MAPCOM
one mile
17/33
198
14
(TO 33)
3
MATCH LINE (SEE INSET BELOW)
DC D&CC
GLOUCESTER
MATHEWS CO.
MIDDLESEX
KING & QUEEN
York River
Mobjack Bay
KELLERCO
1-5-94
A
CURRENT PLAN
King & Queen Co.
MATCH TO ABOVE
GLOUCESTER CO.
PURTAN ISLAND
INSET


GLOUCESTER COUNTY
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MATCH LINE (SEE INSET BELOW)
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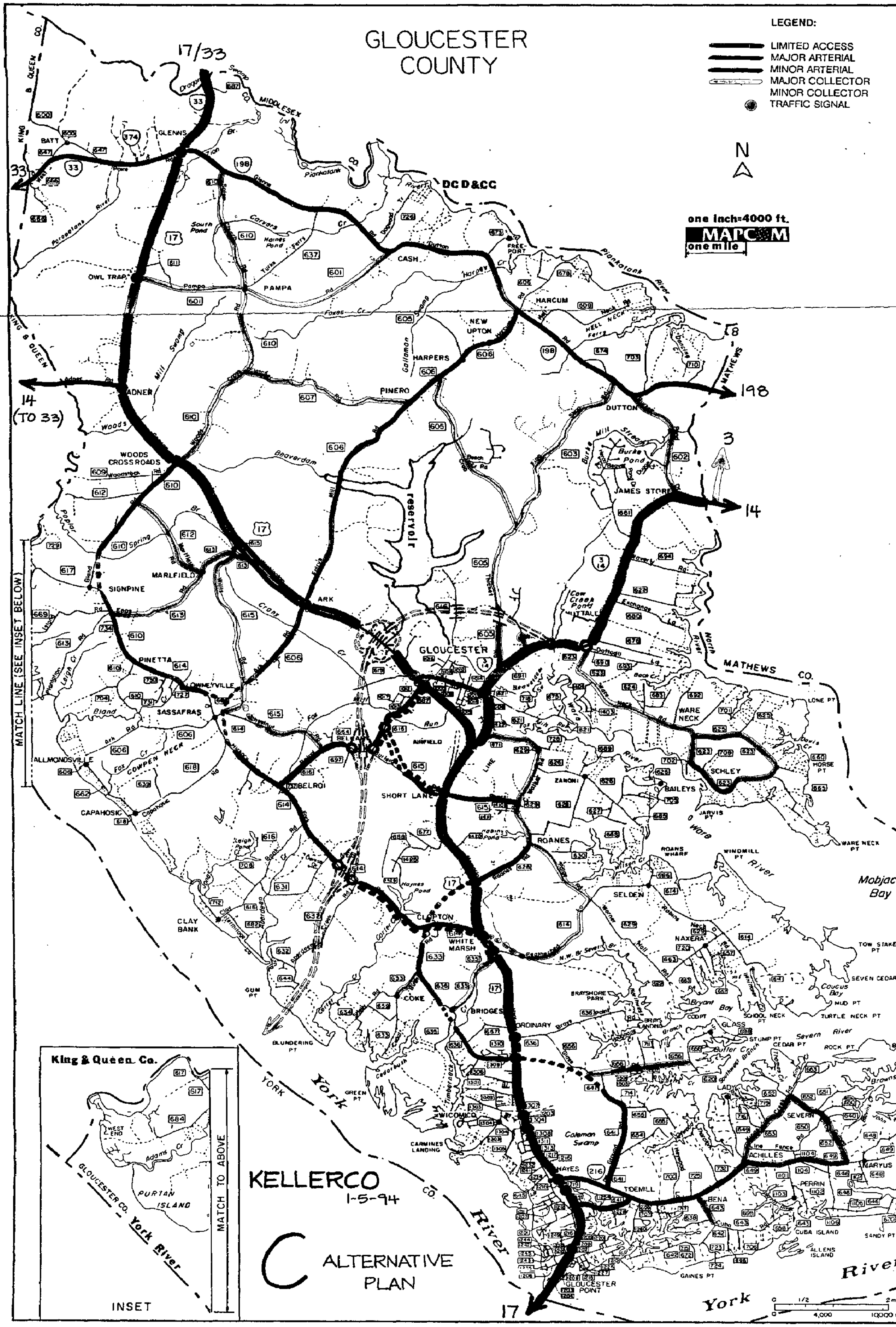
MATHEWS CO.
York River
Mobjack Bay
KELLERCO
1-5-94
B ALTERNATIVE PLAN
King & Queen Co.
MATCH TO ABOVE
GLOUCESTER CO.
PURTAN ISLAND
INSET


GLOUCESTER
COUNTY
LEGEND:
LIMITED ACCESS
MAJOR ARTERIAL
MINOR ARTERIAL
MAJOR COLLECTOR
MINOR COLLECTOR
TRAFFIC SIGNAL
N
one inch=4000 ft.
MAPCOM
one mile
17/33
33
198
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(TO 33)
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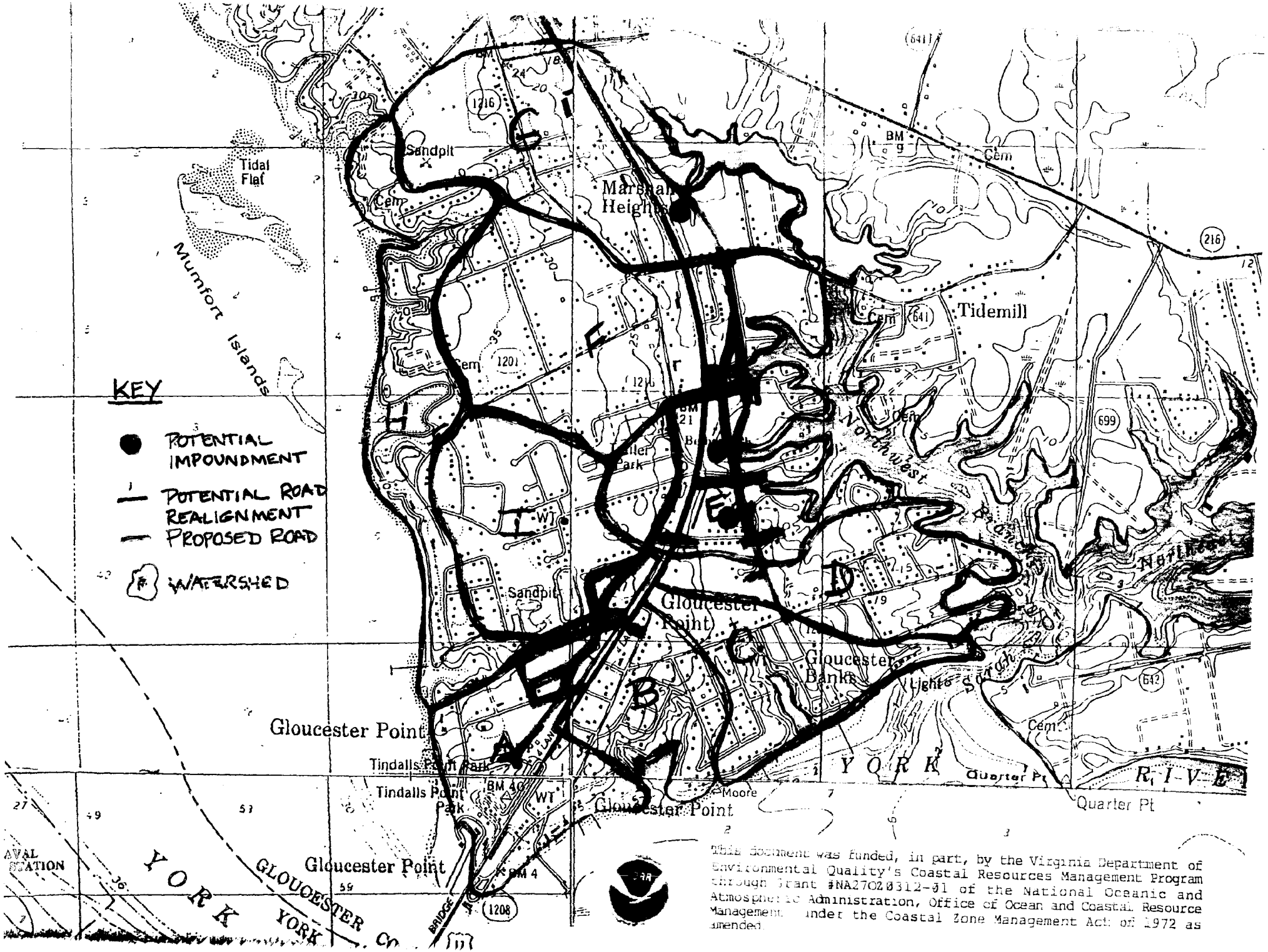
17
MIDDLESEX CO.
MATHEWS
MATHEWS CO.
KING & QUEEN
DCD&CC
GLENNS
BATT
OWL TRAP
PAMPA
CASH
FREE-PORT
HARCUM
NEW UPTON
HARPERS
PINERO
ADNER
DUTTON
WOODS CROSS ROADS
JAMES STORE
reservoir
SIGNPINE
MARLFIELD
ARK
GLOUCESTER
PINETTA
LOWRYVILLE
SASSAFRAS
ALLMONDSVILLE
CAPAHOSIC
BELROI
SHORT LANE
AIRFIELD
ZANONI
BAILEYS
WARE NECK
SCHLEY
ROANES
SELDEN
NAXERA
CLAY BANK
CLOPTON
WHITE MARSH
COKE
BRIDGES
ORDINARY
GUM PT
BLUNDERING PT
GREEN PT
WICOMICO
CARMINES LANDING
HAYES
TOEMILL
BENA
ACHILLES
SEVERN
MARYUS
PERRIN
GLOUCESTER POINT
CUBA ISLAND
ALLENS ISLAND
GAINES PT
SANDY PT
Mobjack Bay
York River
MATCH LINE (SEE INSET BELOW)
King & Queen Co.
WEST END
PURTAN ISLAND
GLOUCESTER CO.
York River
MATCH TO ABOVE
INSET
KELLERCO
1-5-94
C ALTERNATIVE PLAN
0 1/2 2 miles
0 4,000 10,000 feet

GLOUCESTER POINT TRANSPORTATION & STORMWATER MANAGEMENT STUDY

Gloucester County Office of Community Development
Gloucester, Virginia
March 1994

VCRMP Grant Program
FY 1993



This document was funded, in part, by the Virginia Department of Environmental Quality's Coastal Resources Management Program through Grant #NA27OZ0312-01 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management under the Coastal Zone Management Act of 1972 as amended.

DRAFT
Transportation Modelling Analysis

Gloucester County, Virginia
March 1994

Prepared with the assistance of the Hampton Roads Planning District Commission

VCRMP Grant Program
FY 1992-1993

This document was funded in part, by the Virginia Council on the Environment's Coastal Resources Management Program through Grant # NA270Z0312-01 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972 as amended

February 11, 1994

MEMORANDUM

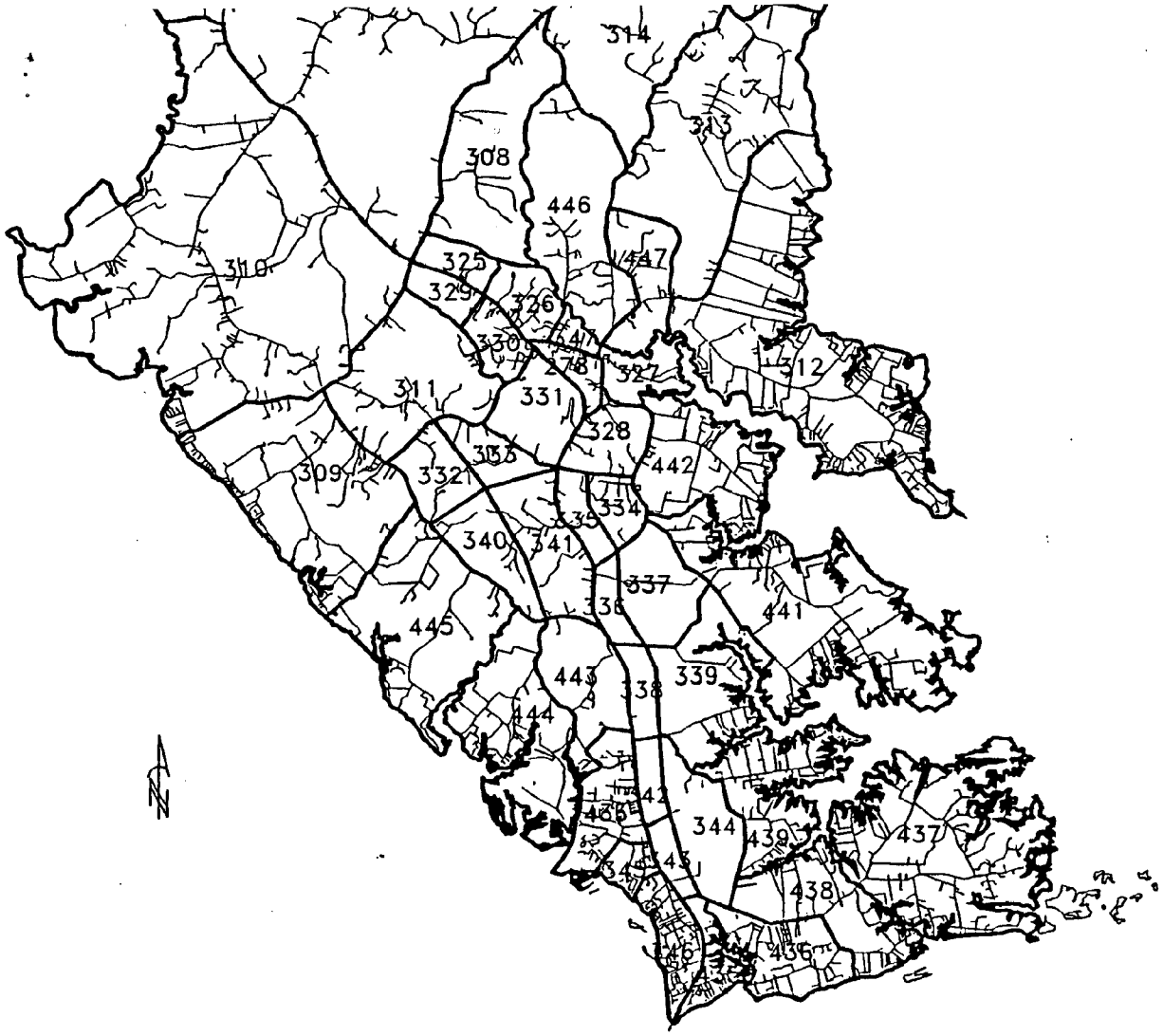
TO: Gloucester Study Staff

BY: Camelia Ravanbakht

RE: Gloucester Study

The 2015 traffic projections were revised due to two errors depicted in the network (2 link distances). Therefore, the MINUTP model was performed for both trend and accelerated growth scenarios for daily, morning and evening peak hours. the following items are attached for your review:

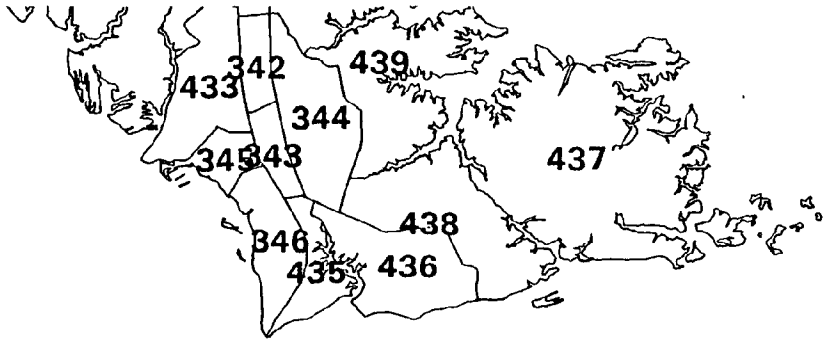
- o Traffic Analysis zones (2 maps).
- o Summary Table showing 1990, 2010 and 2015 land use and travel demand data (table).
- o 1990 Base - daily, morning and evening peak hours traffic volumes (3 maps).
- o 2015 Trend Growth - daily, morning and evening peak hours traffic projections (3 maps).
- o 2015 Accelerated Growth - daily, morning and evening peak hours traffic projections (3 maps).
- o 1990 socioeconomic data used in MINUTP model (table).
- o 2015 land use data developed by LDR (table).



TRAFFIC ANALYSIS ZONES

FOR GLOUCESTER COUNTY
SUBAREA COMPUTER
MODELING STUDY
BASE RUN 10/13/93

G390



Traffic Analysis Zone

Gloucester County

0 5000 10000

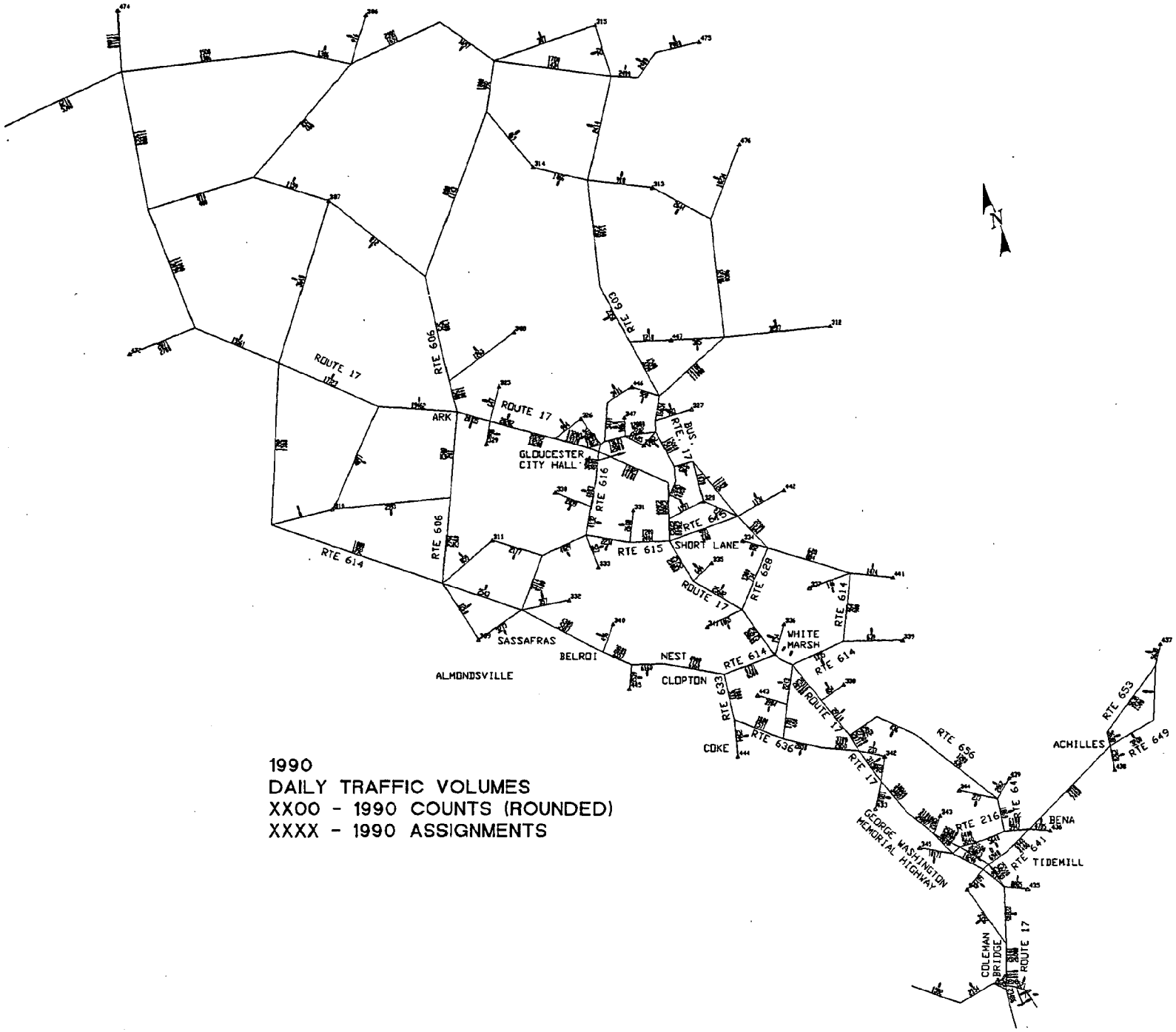
TABLE
GLOUCESTER COUNTY SUBAREA COMPUTER MODELING STUDY
LAND USE AND TRAVEL DEMAND
1990, 2010,2015

Land Use Scenario	Land Use Data			Daily Travel Demand (vpd)		
	Population	Retail Employment	Total Employment	Coleman Bridge	Upriver Crossing	Total Demand
1990 Base	30,131	1,777	9,154			
Actual Counts				26,000	---	26,000
Model Assignments				26,200	---	26,200
2010 PATS	37,700	5,300	13,300			
With Upriver Crossing				45,400	18,700	64,100
Without Upriver Crossing				57,100	---	57,100
2015 Trend Growth						
With Upriver Crossing	55,613	6,193	19,239	51,400	39,300	90,700
Without Upriver Crossing	55,615	6,712	19,239	70,500	---	70,500
2015 Accelerated Growth						
With Upriver Crossing	86,461	10,866	32,755	53,400	43,600	97,000
Without Upriver Crossing	86,481	10,993	32,755	78,500	---	78,500

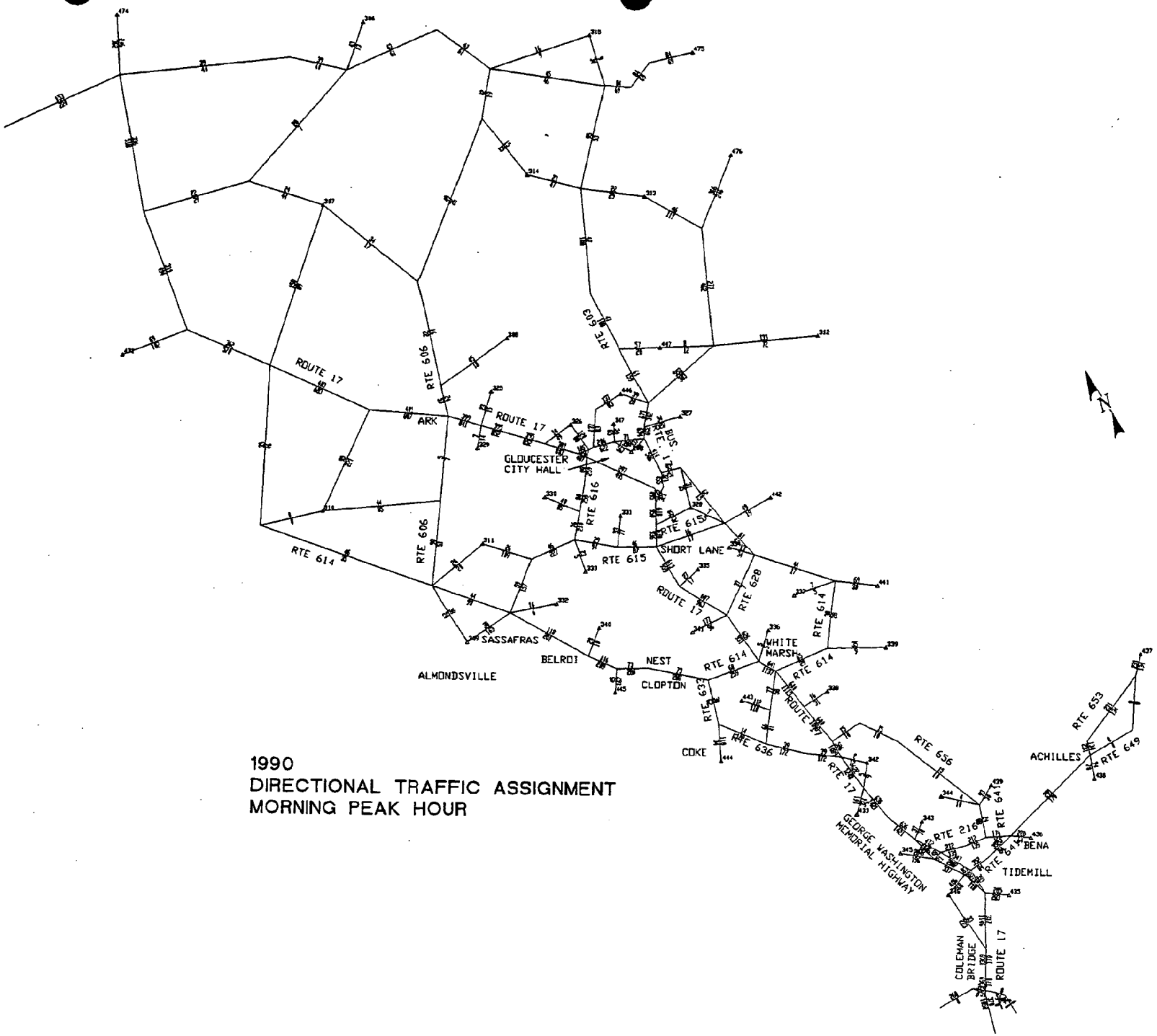
does not match PATS vmax.

Notes:
- vpd:vehicles per day
- PATS : Peninsula Area Transportation Study
- 2015 model assumed 2015 projectd land use data for Gloucester and York Counties only; the model used 2010 projected land use for other localities in the Peninsula region.

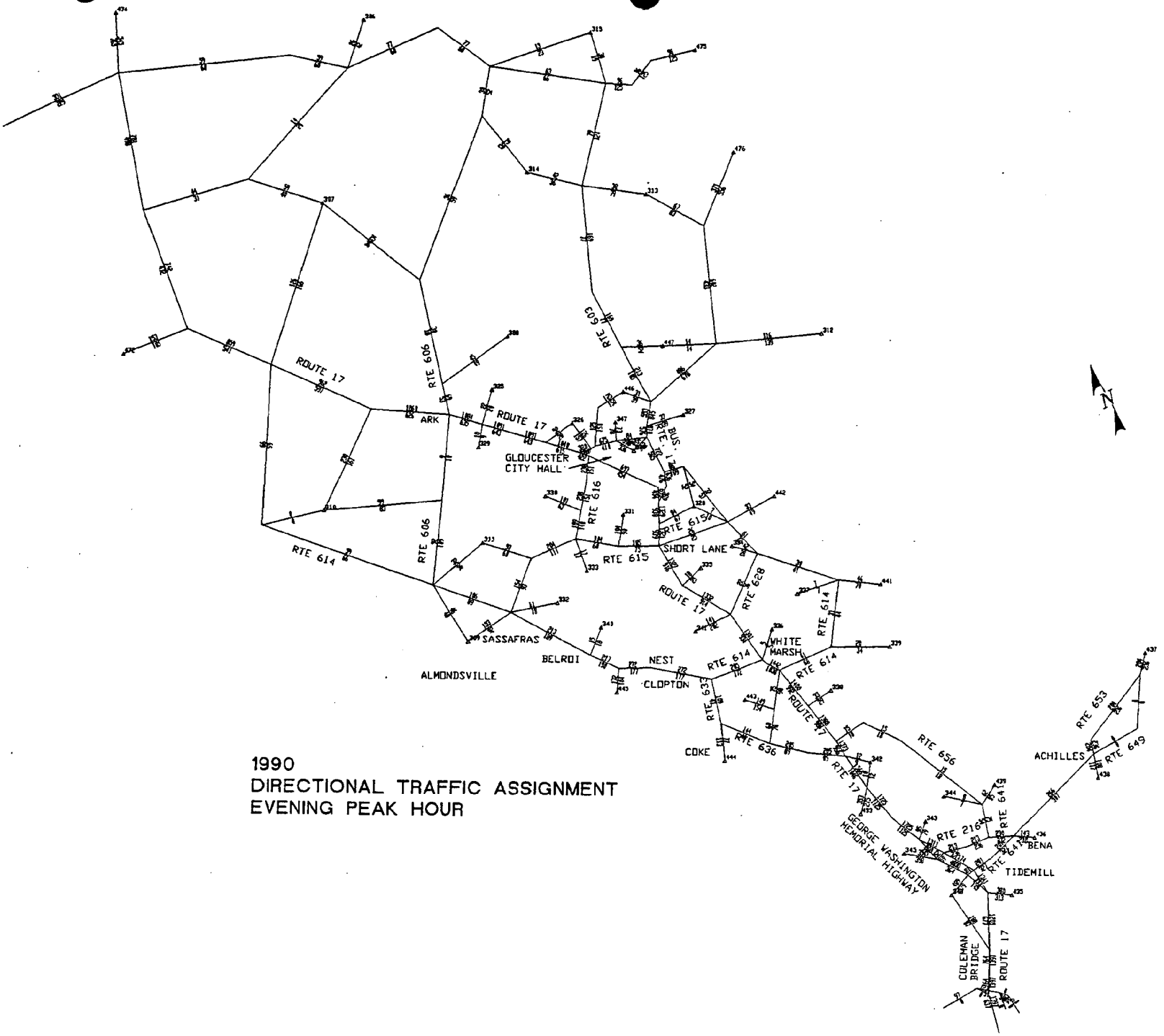
Prepared By: Hampton Roads Planning District Commission, February 1994.



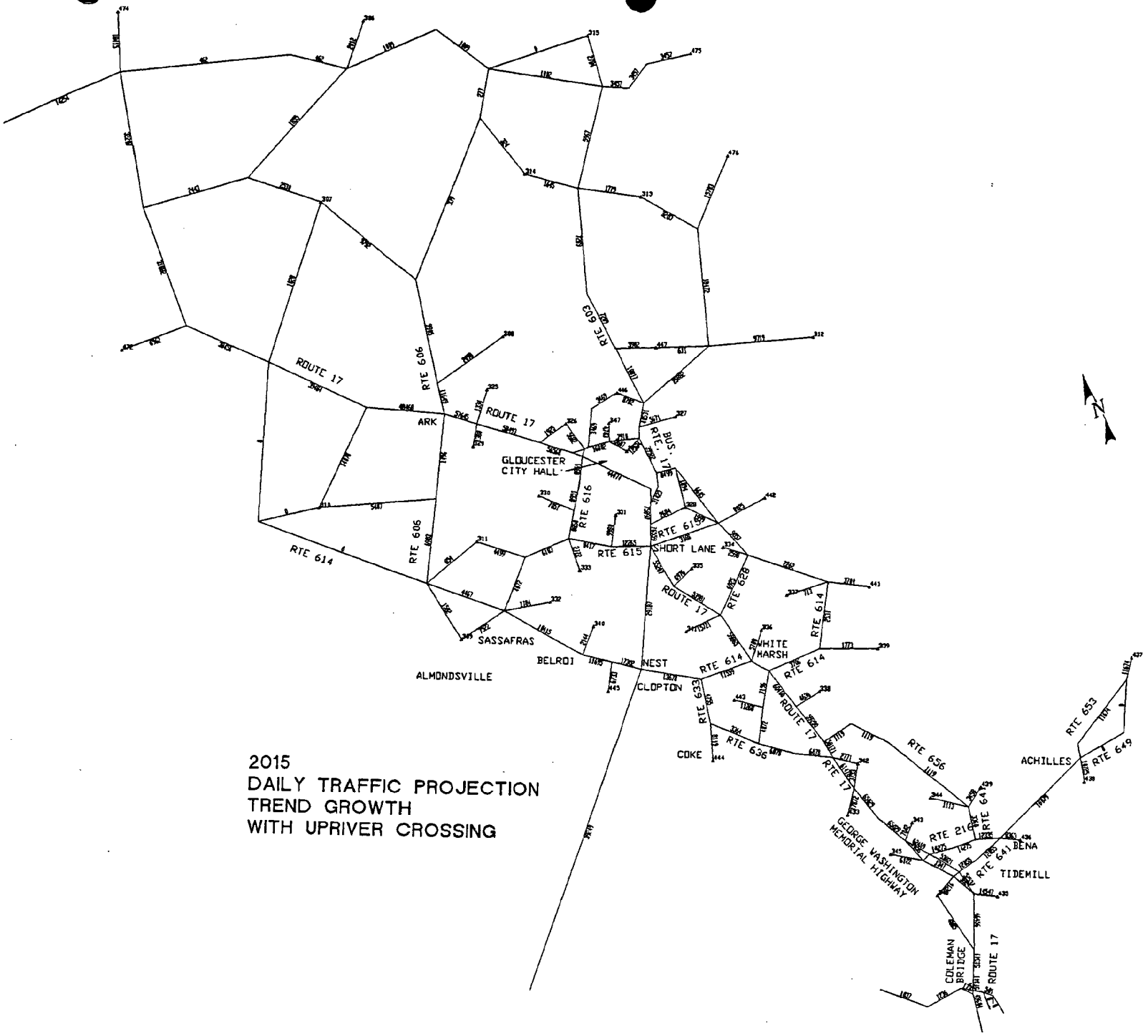
1990
DAILY TRAFFIC VOLUMES
XX00 - 1990 COUNTS (ROUNDED)
XXXX - 1990 ASSIGNMENTS



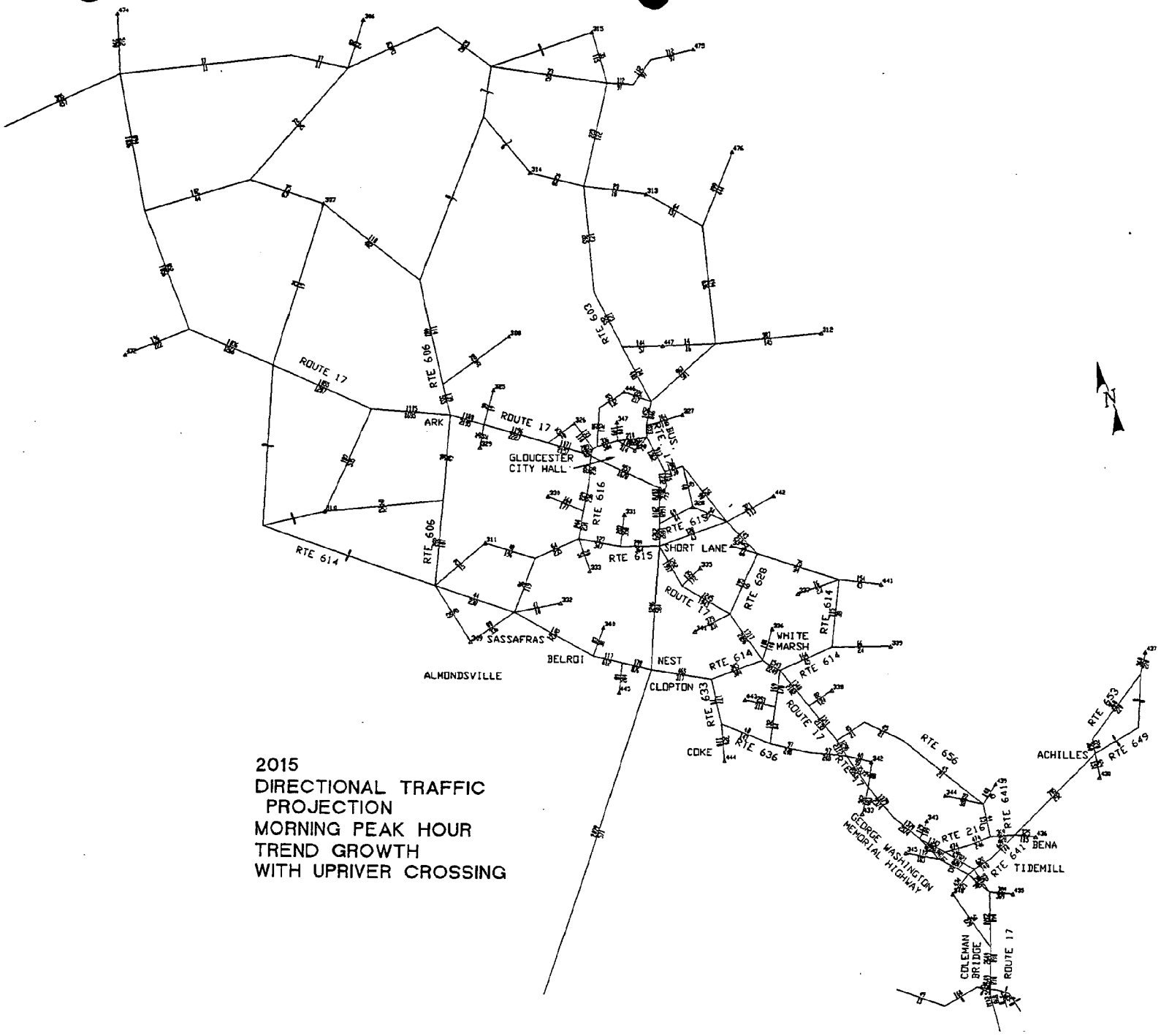
1990
DIRECTIONAL TRAFFIC ASSIGNMENT
MORNING PEAK HOUR



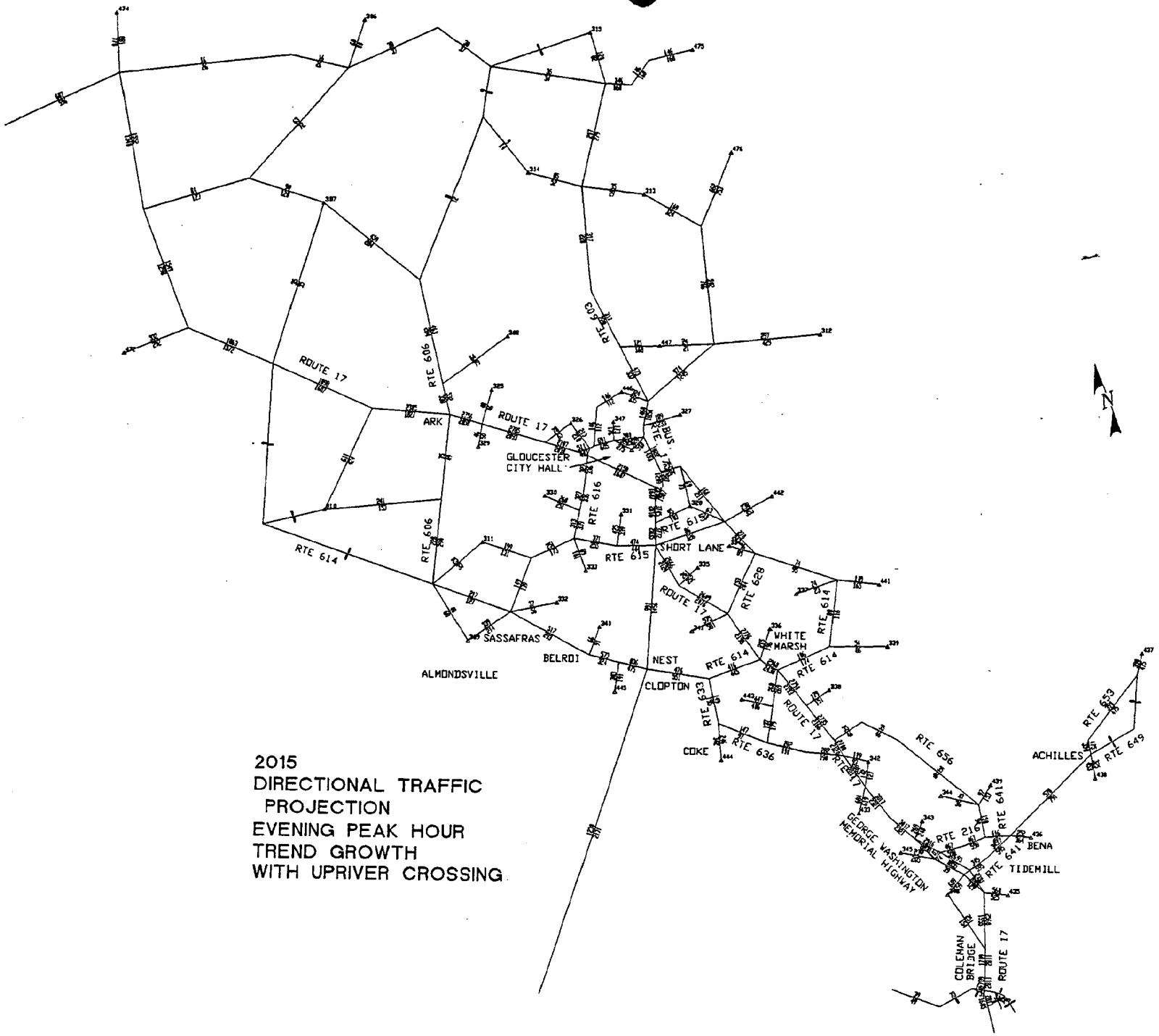
1990
DIRECTIONAL TRAFFIC ASSIGNMENT
EVENING PEAK HOUR



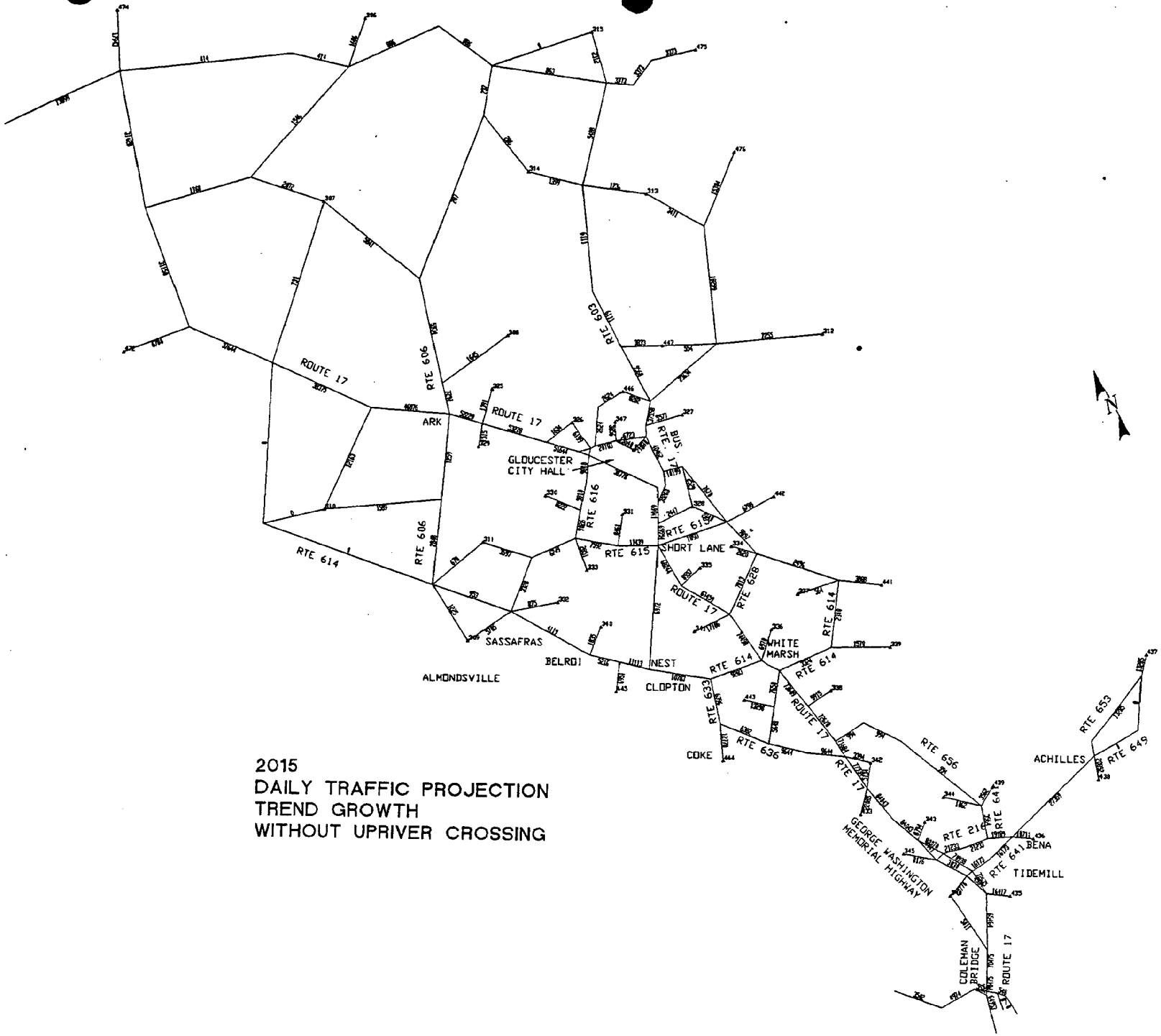
2015
DAILY TRAFFIC PROJECTION
TREND GROWTH
WITH UPRIVER CROSSING



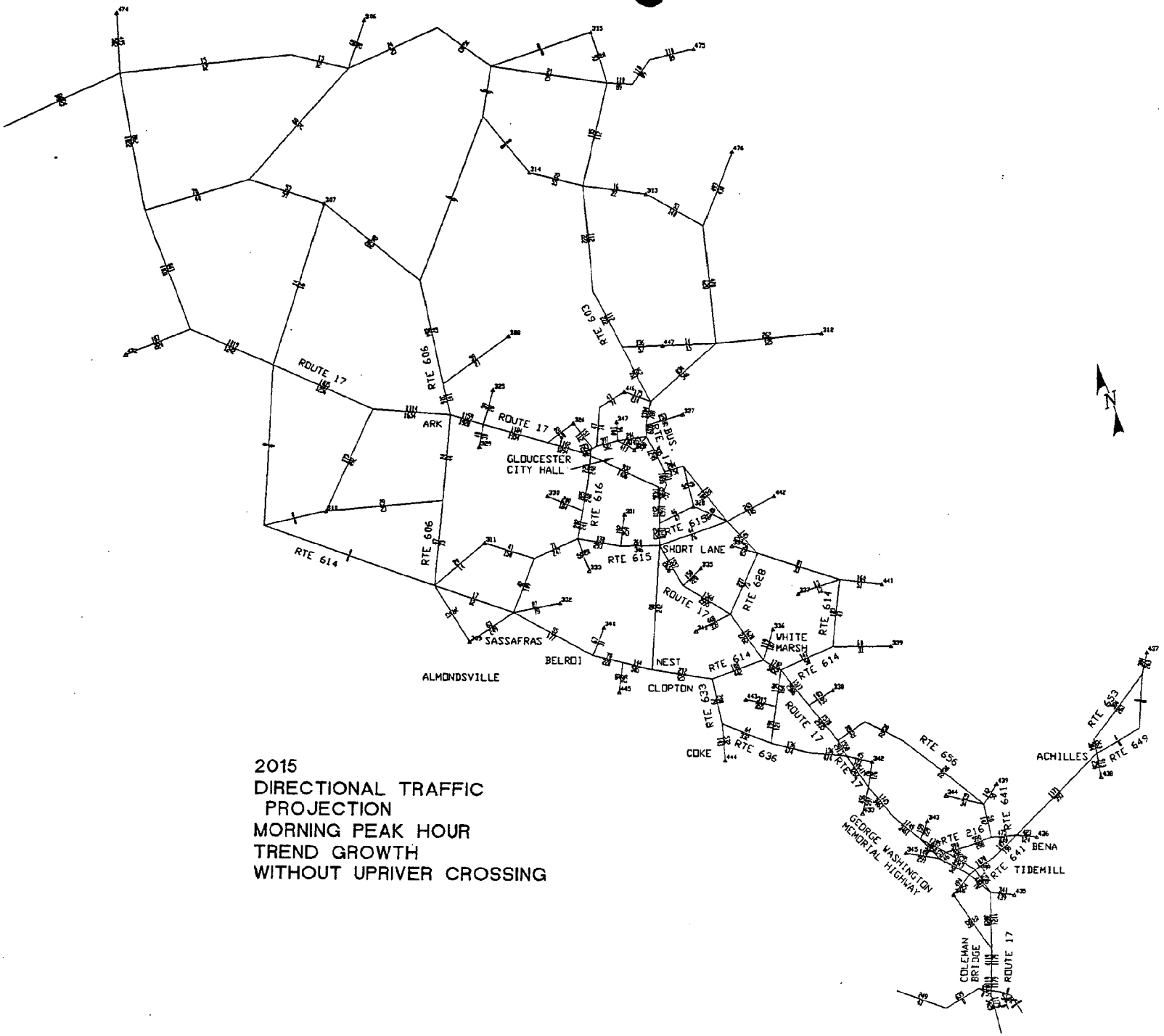
2015
DIRECTIONAL TRAFFIC
PROJECTION
MORNING PEAK HOUR
TREND GROWTH
WITH UPRIVER CROSSING



2015
DIRECTIONAL TRAFFIC
PROJECTION
EVENING PEAK HOUR
TREND GROWTH
WITH UPRIVER CROSSING



2015
DAILY TRAFFIC PROJECTION
TREND GROWTH
WITHOUT UPRIVER CROSSING



2015
DIRECTIONAL TRAFFIC
PROJECTION
MORNING PEAK HOUR
TREND GROWTH
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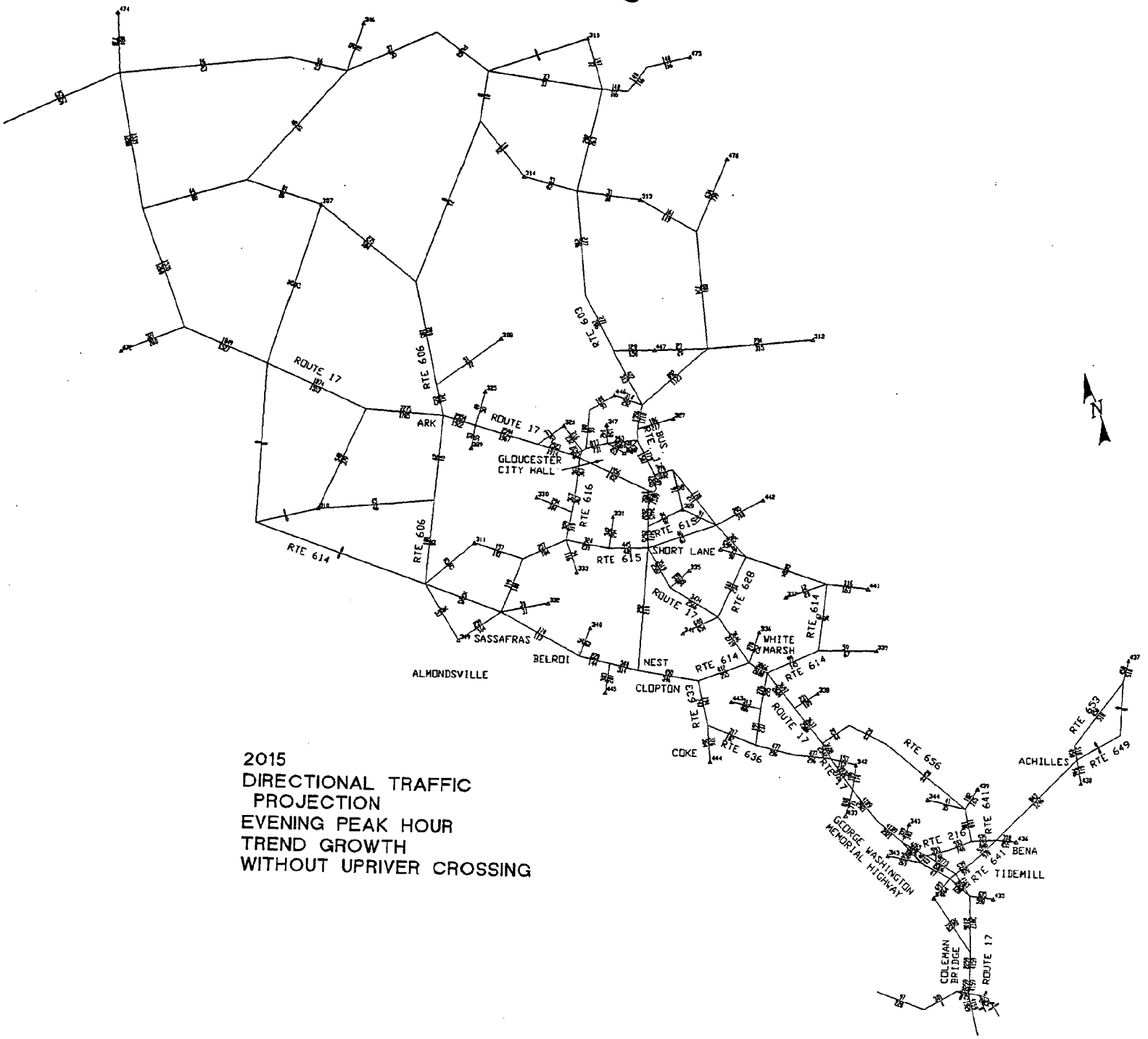
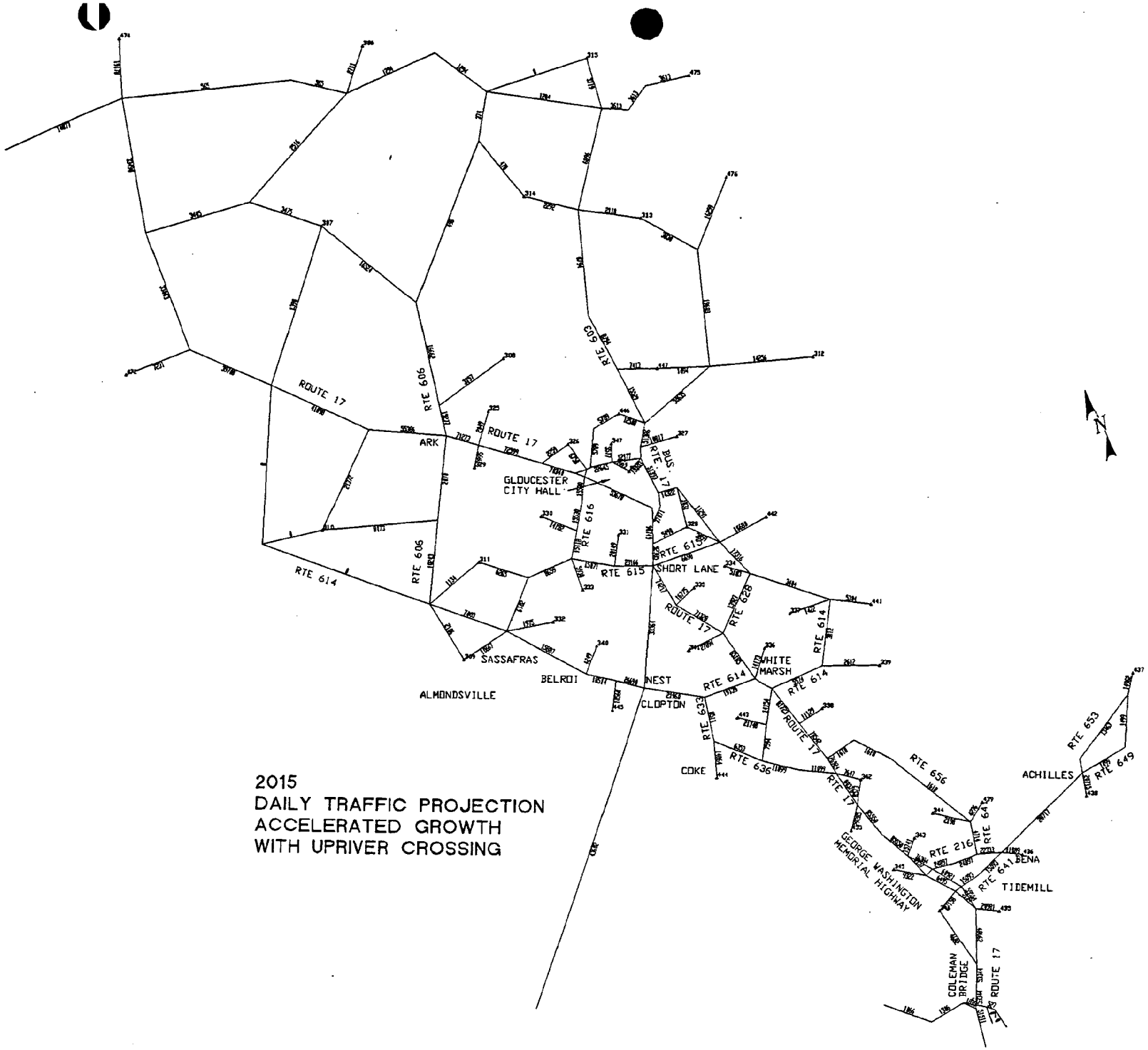
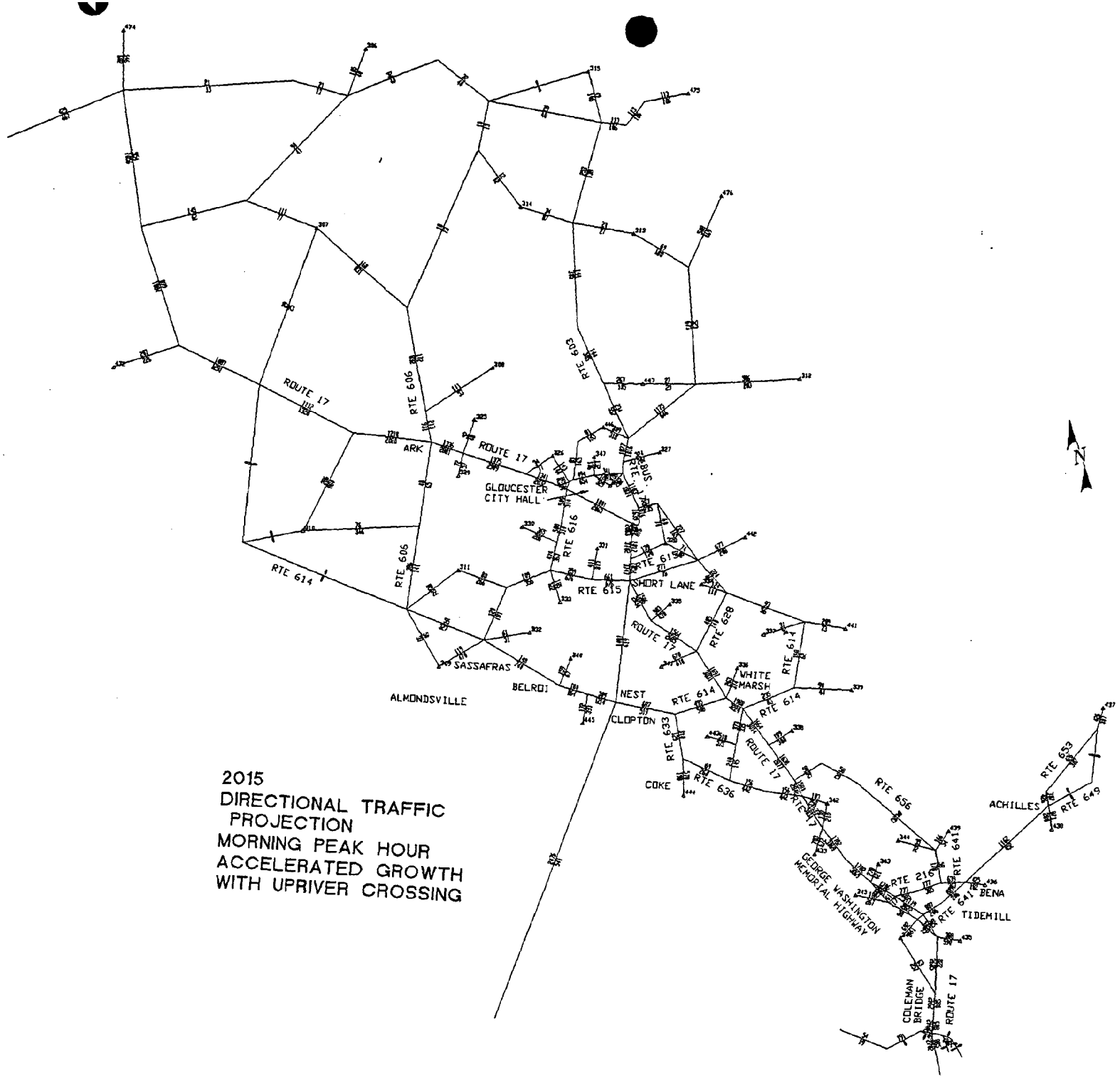


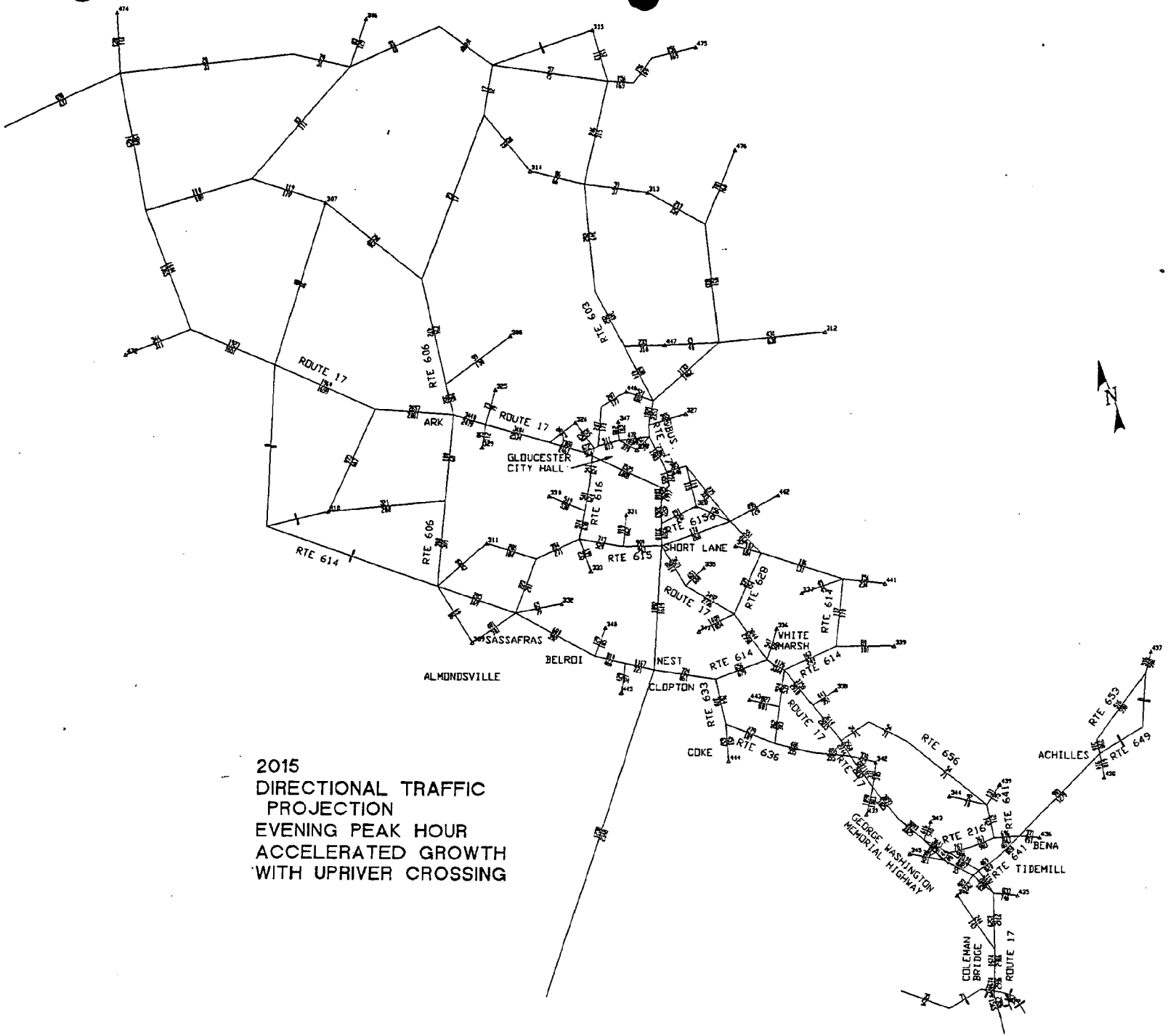
2015
DIRECTIONAL TRAFFIC
PROJECTION
EVENING PEAK HOUR
TREND GROWTH
WITHOUT UPRIVER CROSSING



2015
DAILY TRAFFIC PROJECTION
ACCELERATED GROWTH
WITH UPRIVER CROSSING



2015
DIRECTIONAL TRAFFIC
PROJECTION
MORNING PEAK HOUR
ACCELERATED GROWTH
WITH UPRIVER CROSSING



2015
DIRECTIONAL TRAFFIC
PROJECTION
EVENING PEAK HOUR
ACCELERATED GROWTH
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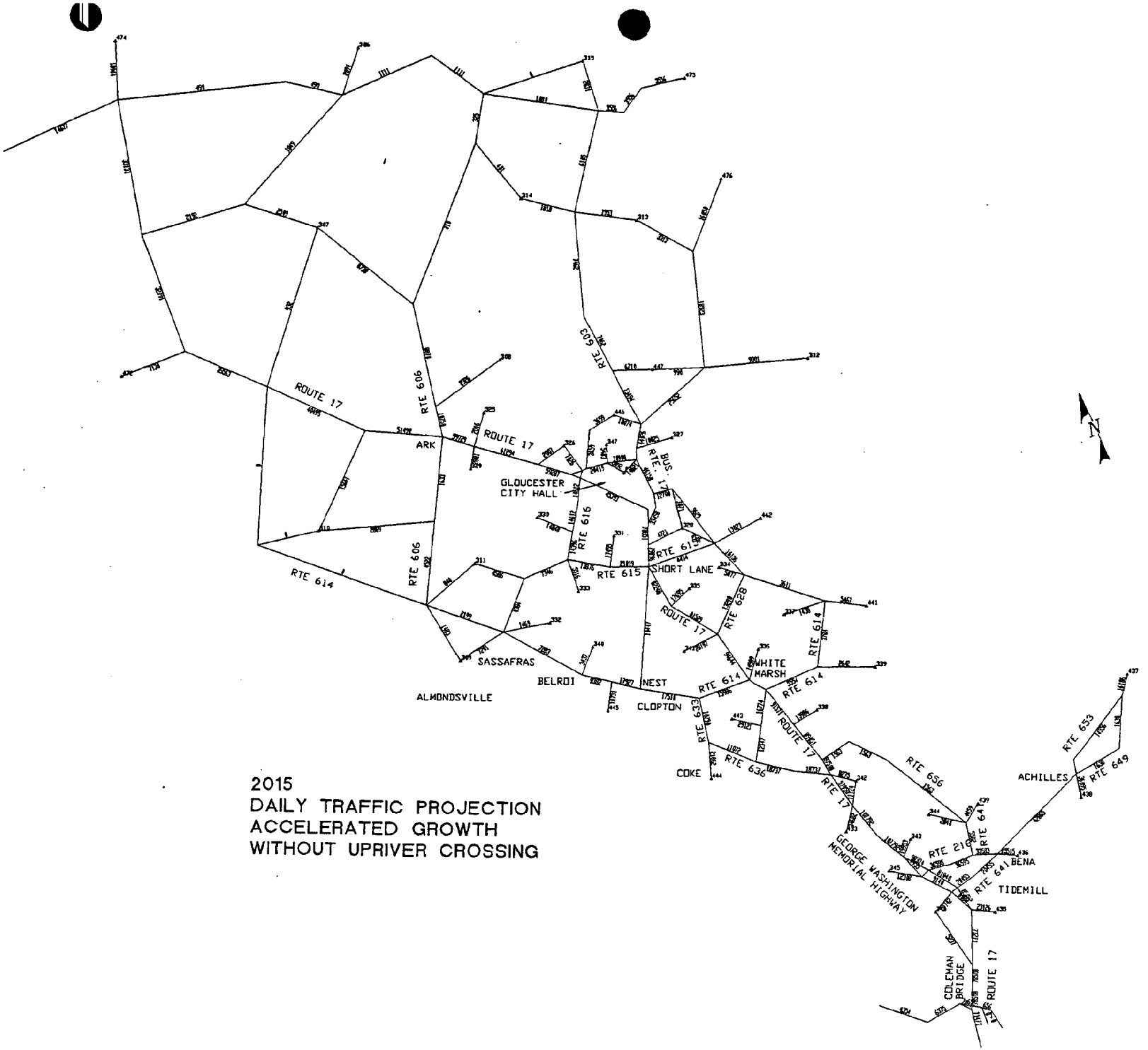
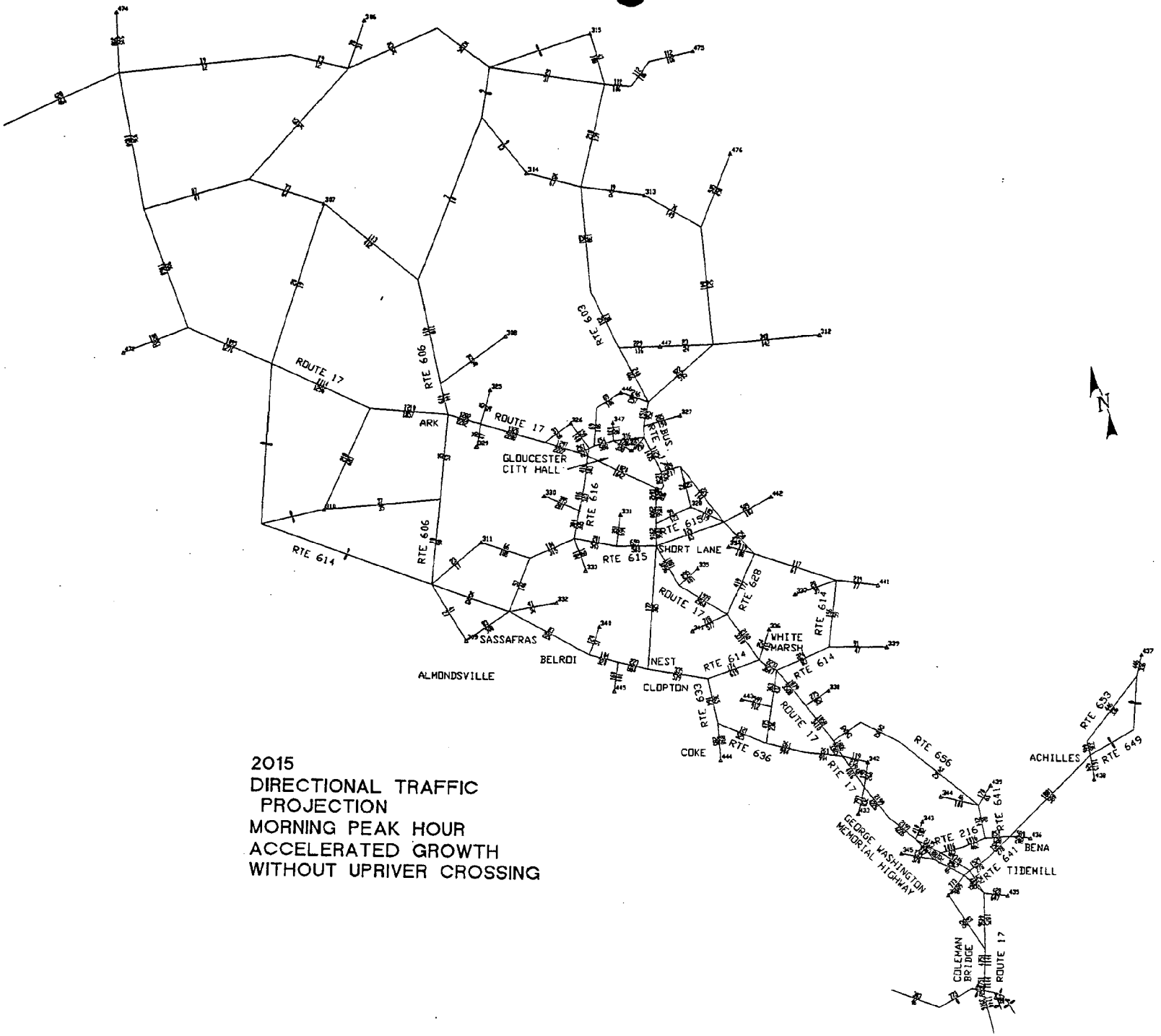


2015
DAILY TRAFFIC PROJECTION
ACCELERATED GROWTH
WITHOUT UPRIVER CROSSING



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PROJECTION
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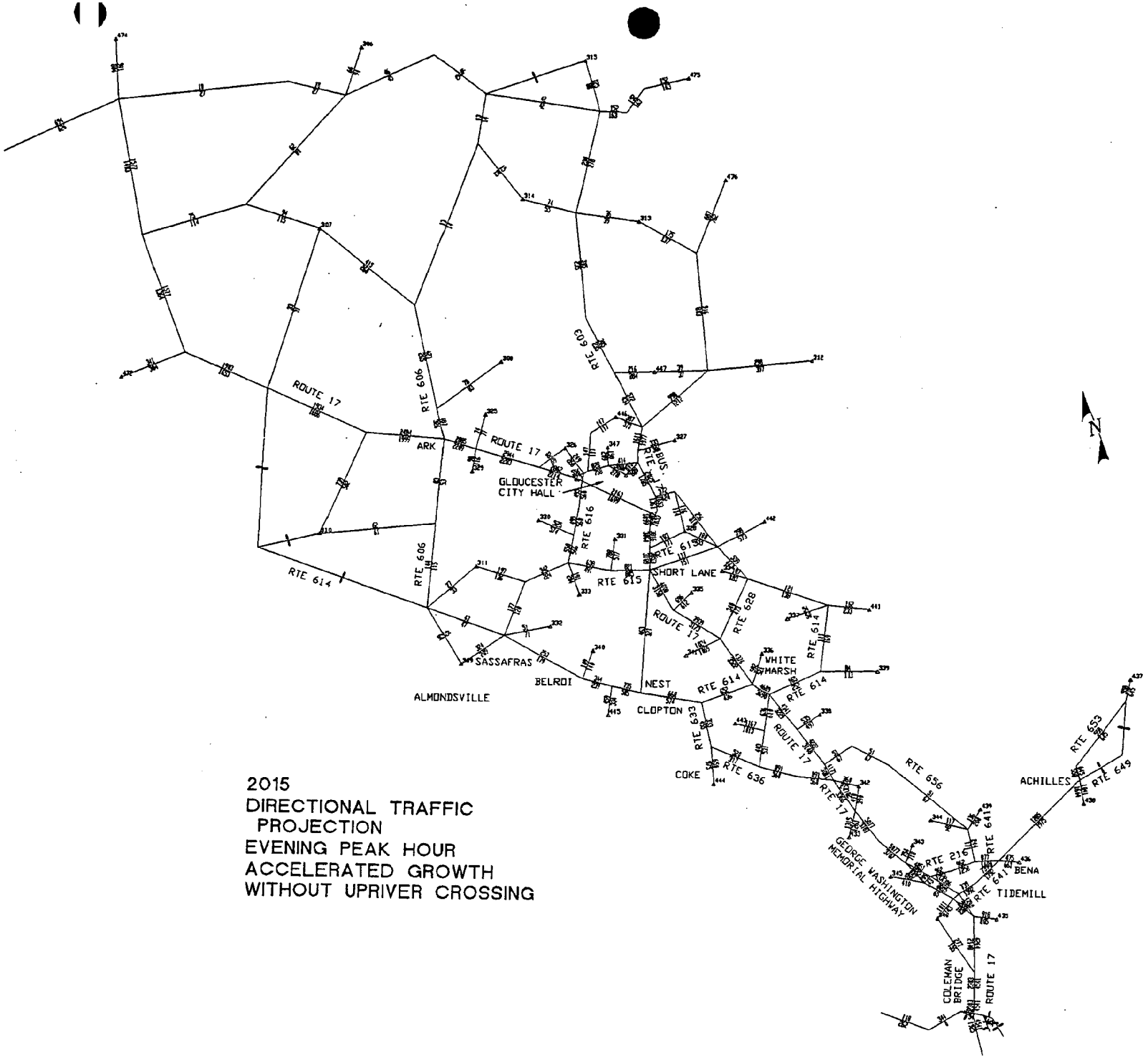
WITHOUT UPRIVER CROSSING



2015
DIRECTIONAL TRAFFIC
PROJECTION
EVENING PEAK HOUR
ACCELERATED GROWTH
WITHOUT UPRIVER CROSSING

Gloucester socioeconomic data for MINUTP runs (1990) 12/2/93

TAZG390	Population	Total Emp	White Collar Emp	Retail Emp	Student Attendance	Households
278	420	2832	2122	485		190
306	303	0				159
307	1533	525	320	35		600
308	278	9	8	9		101
309	1377	0				594
310	2200	216	182	7	1476	853
311	901	0				354
312	995	210	26	2		498
313	895	108	33	27		348
314	384	27	24			128
315	333	5	4	5		210
325	135	20	18	5		65
326	442	560	488	26	632	110
327	210	63	58			84
328	247	171	115	87		109
329	69	0				28
330	580	0				252
331	191	82	73	61		87
332	91	0				36
333	142	0				56
334	218	0				78
335	166	0				60
336	11	0				5
337	6	0			1765	3
338	39	27	24	24		17
339	265	0				109
340	131	0				52
341	480	642	423	16		176
342	0	28	26	12		0
343	87	89	80	67	730	41
344	53	0				24
345	723	347	305	285		286
346	2760	761	477	303		1187
347	388	146	106	5		151
433	2189	284	124	9	631	856
435	1201	839	682	181		552
436	1538	0				655
437	1724	456	48	2	455	757
438	574	112	100	46		250
439	626	0				294
441	494	0				239
442	339	0				147
443	769	272	129	65		271
444	821	0				325
445	1221	0				490
446	1112	325	124	11		397
447	471	0				159
	30131	9154	6120	1777	5689	12443

2015 Land Use (Trend and Accelerated Growth and Buildout, with and without upriver crossing

	Trend With				Trend Without				Accelerated With				Accelerated Without				Buildout			
Zone	Pop	WCEm	RetEm	Emp	Pop	WCEm	RetEm	Emp	Pop	WCEm	RetEm	Emp	Pop	WCEm	RetEm	Emp	Pop	WCEm	RetEm	Emp
278	686	2518	617	3091	669	2414	593	2965	1008	2544	625	3124	917	2548	626	3129	2389	1914	470	2351
306	527	15	11	20	437	15	11	20	666	37	26	47	498	37	26	47	664	235	182	267
307	4346	445	300	546	2562	445	300	546	7208	467	315	573	3902	467	315	573	11884	766	590	867
308	447	23	16	29	322	23	16	29	649	44	30	56	417	44	30	56	961	235	182	267
309	2386	15	11	20	1779	15	11	20	3316	37	26	47	2184	37	26	47	3408	279	216	317
310	5053	192	129	236	3206	192	129	236	7998	214	145	263	4599	214	145	263	12762	324	249	367
311	1340	15	11	20	1044	15	11	20	1813	37	26	47	1266	37	26	47	2526	279	216	317
312	2564	186	125	230	1691	186	125	230	3902	209	141	258	2272	209	141	258	4121	324	249	367
313	1013	103	70	128	913	103	70	128	1176	124	85	155	988	124	85	155	1366	324	249	367
314	451	16	11	20	366	16	11	20	588	36	25	47	429	36	25	47	790	279	216	317
315	717	20	14	25	586	20	14	25	920	41	28	52	673	41	28	52	922	235	175	267
325	195	42	19	57	173	49	23	67	229	88	40	115	188	92	43	122	275	341	154	441
326	434	463	209	598	412	469	212	608	666	506	229	656	586	511	232	663	1617	1115	504	1441
327	830	131	101	150	776	131	101	150	1723	231	178	263	1474	231	178	263	5685	464	357	525
328	744	291	132	379	705	339	153	439	1432	545	247	707	1242	576	261	747	4470	1024	463	1323
329	127	64	29	86	90	82	38	110	183	169	77	221	117	181	82	237	273	339	154	440
330	825	310	141	403	793	403	182	521	1113	805	364	1041	1008	865	391	1118	2262	1022	463	1323
331	832	582	193	1768	781	439	160	1121	1723	1191	348	4324	1476	990	303	3395	5669	14175	5807	26923
332	217	15	11	20	137	15	11	20	344	37	26	47	198	37	26	47	552	279	216	317
333	490	64	29	86	442	82	38	110	986	169	77	221	817	181	82	237	3069	339	154	440
334	295	76	58	87	285	76	58	87	444	176	136	200	403	176	136	200	1089	463	356	525
335	493	394	179	512	466	512	232	664	993	1024	463	1325	854	1100	497	1423	3201	2730	1234	3527
336	376	330	150	428	346	426	193	553	878	854	386	1104	752	918	415	1186	3219	2390	1080	3086
337	100	15	11	20	54	15	11	20	190	37	26	47	193	37	26	47	345	279	216	317
338	239	288	131	376	285	367	166	477	525	714	324	926	1003	768	347	993	1786	1706	771	2204
339	386	15	11	20	327	15	11	20	505	37	26	47	508	37	26	47	680	279	216	317
340	483	15	11	20	390	15	11	20	944	37	26	47	712	37	26	47	2653	279	216	317
341	1369	875	395	1131	1286	986	446	1275	2711	1472	666	1904	2330	1549	699	1999	8628	1364	617	1764
342	163	460	207	595	203	588	267	762	398	1155	523	1495	795	1240	561	1603	1445	2390	1080	3086
343	412	422	192	548	486	525	238	681	861	982	445	1272	1620	1051	475	1360	2851	2048	926	2645
344	210	15	11	20	185	15	11	20	393	37	26	47	556	37	26	47	957	279	216	317
345	981	186	85	243	1425	210	95	275	1388	322	146	417	2081	337	153	438	2090	339	154	441
346	3013	1015	459	1312	3194	1138	515	1472	3179	1687	763	2181	3462	1770	800	2286	3210	1364	617	1764
347	478	326	80	400	468	221	55	274	634	355	88	438	590	355	88	438	1296	1077	265	1323
433	2464	715	324	927	3050	861	390	1114	3004	1497	678	1940	3921	1596	722	2063	3817	1364	617	1764
435	1410	1005	454	1300	1508	1107	501	1433	1501	1564	707	2023	1654	1633	738	2110	1540	1706	771	2204
436	2003	76	58	87	2635	76	58	87	2584	176	136	200	3575	176	136	200	3527	463	356	525
437	2113	389	262	477	2145	443	298	544	2379	536	361	657	2413	536	361	657	2264	633	488	717
438	2740	158	109	199	6059	158	109	199	5795	251	170	312	10994	251	170	312	11507	324	249	367
439	859	15	11	20	876	15	11	20	1000	37	26	47	1020	37	26	47	966	279	216	317
441	954	15	11	20	998	15	11	20	1322	37	26	47	1371	37	26	47	1357	279	216	317
442	2033	70	48	87	1649	70	48	87	4370	164	110	200	3226	164	110	200	8543	0	0	525
443	1718	621	281	804	1964	741	336	960	3226	1271	575	1644	5783	1349	611	1745	9902	1022	463	1323
444	1984	76	58	87	3387	76	58	87	3550	176	136	200	5732	176	136	200	5927	463	356	525
445	1810	15	11	20	1881	15	11	20	2418	164	110	200	2501	164	110	200	2455	279	216	317
446	1364	618	349	1500	1293	419	305	596	1901	854	593	1371	1688	577	365	1157	3993	1397	821	3177
447	939	76	58	87	886	76	58	87	1725	176	136	200	1493	176	136	200	5141	463	356	525
	55613	13791	6193	19239	55615	14634	6712	19239	86461	23323	10866	32755	86481	23742	10093	32755	160054	49951	24355	73480

V. APPENDIX

LIST OF STATE AND FEDERAL AGENCIES INVOLVED IN STORMWATER MANAGEMENT

State Agencies

1) DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION (DEQ)
202 N. 9th Street, Suite 900
Richmond, Virginia 23219
(804) 786-4500

DEQ Tidewater Regional Office
Pembroke II, Suite 310
Virginia Beach, Virginia 23462
(804) 552-1840

Role related to stormwater:

- o Issues Virginia Pollution Discharge Elimination System (VPDES) permits

Section 402 of the Clean Water Act (CWA) established the National Pollution Discharge Elimination System (NPDES) to limit the discharge of pollution into streams, rivers, and bays. In 1987, the CWA was amended requiring EPA to regulate stormwater discharges under the NPDES Program. Under this amended federal program, localities having populations over 100,000 must develop stormwater management plans and obtain discharge permits for stormwater outfalls. In Virginia, DEQ is authorized by the EPA to administer this NPDES program and is also responsible for the implementation of the federally mandated program for stormwater discharges. DEQ calls its program the Virginia Pollution Discharge Elimination System (VPDES) and issues VPDES permits to localities for discharges from large municipal stormwater systems and to industrial facilities for the discharge of stormwater associated with industrial activities into streams and rivers. EPA regulations define 11 categories of industrial activities. Construction activities that result in the disturbance of five acres or more and have a point source discharge of stormwater to state waters are considered industrial activity and must obtain a VPDES permit.

The VPDES permits issued by DEQ for stormwater discharges must be in accordance with the stormwater regulations developed by EPA and EPA maintains the authority to review any applications and permits. (Major dischargers require EPA review).

- o Issues Virginia Water Protection Permits (VWP)

Section 401 of the Clean Water Act requires any applicant applying for a federal permit or license to obtain a 401 Water Quality Certification verifying that the water quality concerns of the state will be complied with before undertaking any activity which could result in a discharge to waters of the U.S., including wetlands. This certification becomes part of the issued federal permit. A federal permit will not be issued without this certification from the state. In Virginia, DEQ is authorized to issue these 401 Water Quality Certificates. However, in 1989 the Virginia Water Protection Permit (VWP) was created which constitutes the Water Quality Certification required under the Clean Water Act. Therefore, DEQ now issues VWP permits in place of the 401 Water Quality Certifications.

A VWP permit is required for any stormwater management activity or facility that involves the discharge or placing of any material into or adjacent to state waters, including wetlands. An application to the Army Corps of Engineers (COE) for a permit through the Joint Permit Process (involving COE, VMRC, & DEQ) would require a Virginia Water Protection Permit from DEQ before the permit would be issued. A VWP permit would also be required for any stormwater management facility proposed to be placed within a perennial stream.

o Participates in the joint permit review process

DEQ conducts a joint application review process with the U.S. Army Corps of Engineers (COE) and the Virginia Marine Resources Commission (VMRC) for construction/discharge into all waters of the Commonwealth, tidal wetlands, and bottoms of waterways through Virginia. Through the joint permit review process, DEQ reviews applications for stormwater outfalls proposed to discharge into state waters and looks at the contents of the stormwater discharge that would be released and issues Virginia Water Protection Permits accordingly.

2) DEPARTMENT OF CONSERVATION AND RECREATION - DIVISION OF SOIL AND WATER CONSERVATION (DCR-DSWC)
203 Governor Street, Suite 206
Richmond, Virginia 23219-2094
(804) 786-2064

Role related to stormwater:

o Review state agency stormwater management plans

DCR-DSCW reviews all state agency stormwater management plans (for projects disturbing one or more acres). Stormwater management plans must be approved by DCR before a state agency may begin any land disturbing activity.

o Develop regulations establishing technical standards and minimum requirements for local stormwater management programs

The Virginia Stormwater Management Act gives local governments the authority to establish stormwater management plans and adopt local ordinances requiring the control and treatment of stormwater runoff. This authority is optional. Localities are not required to adopt a local stormwater management program. However, if a locality does establish a local program, the minimum requirements contained in the state regulations must be met. DCR-DSCW has the responsibility of developing these state regulations establishing the technical criteria and minimum requirements for local stormwater management programs.

o Review local stormwater management programs

DCR-DSCW reviews those local stormwater management programs that have been established for consistency with state regulations.

o Review local erosion and sediment control (E&SC) programs

DCR conducts periodic reviews of local erosion and sediment control programs for compliance with the minimum standards contained in the state E&SC regulations. Minimum Standard 19 (MS 19) addresses stormwater and requires that properties and waterways downstream from new development sites shall be protected from erosion due to increases in the volume, velocity, and peak flow rate of stormwater runoff. In the absence of a local stormwater management program, certain criteria apply to prevent stormwater from overtopping streambanks or eroding the channel bed.

o Provide technical assistance and training to local governments

DCR provides technical assistance and training relating to stormwater management to local governments and responds to complaints.

3) CHESAPEAKE BAY LOCAL ASSISTANCE BOARD AND DEPARTMENT (CBLAB & CLBAD)
805 E. Broad Street, Suite 701
Richmond, Virginia 23219
1-800-Ches-Bay

Role related to stormwater:

o Develop stormwater management criteria

The Chesapeake Bay Preservation Act (Bay Act) was enacted as a land use management program, recognizing the link between land use and water quality, for the protection of the Chesapeake Bay from nonpoint source pollution. Local governments in Tidewater Virginia are required to adopt local Chesapeake Bay Preservation Programs that are consistent with state regulations. The Chesapeake Bay Local Assistance Board is responsible for the development of state regulations establishing minimum performance standards including stormwater management criteria which must be met when developing (or redeveloping) lands designated as Chesapeake Bay Preservation Areas. The regulations also address the placement of stormwater management facilities and prohibit them from from being placed in resource protection areas, a component of the Chesapeake Bay Preservation Area.

o Review local Chesapeake Bay Preservation programs for consistency with state regulations, including stormwater management requirements

The Chesapeake Bay Local Assistance Board, with assistance from the Department, reviews local government Chesapeake Bay Preservation programs to ensure consistency with the minimum requirements contained in the state regulations. For new development, the post-development nonpoint source pollutant load shall not exceed the pre-development load base upon the average land cover condition for a locality. Redevelopment of a site not currently served by water quality best management practices shall achieve at least a 10% reduction of nonpoint source pollution in runoff compared to the existing runoff load from the site. The regulations allow for several mechanisms to comply with the stormwater management provisions. The most common approaches

are for localities to require on-site controls or compliance with a regional stormwater management plan. Localities also have the option of adopting the state Stormwater Management Regulations along with any additional provisions necessary to meet the water quality requirements of the Chesapeake Bay Preservation Act and Regulations.

- o Provide technical and financial assistance to local governments in the implementation of local stormwater management requirements

The Chesapeake Bay Local Assistance Department provides technical assistance to localities. Engineers and planners at CBLAD provide guidance on stormwater calculations, develop customized stormwater calculation worksheets, provide recommendations for stormwater BMPs, conduct site visits if requested, conduct advisory site plan review, and provide stormwater management training to local government staff. The Department also provides each locality with a Local Assistance Manual which includes information and guidance on meeting the stormwater criteria of the program. CBLAD's grant program provides funding assistance for stormwater research projects, development of stormwater management plans, and other stormwater management related activities.

- o Responsible for ensuring local government compliance with the Act and Regulations

Enforcement of the stormwater management requirements of the local Chesapeake Bay Programs is the responsibility of each local government. The authority for this enforcement is under the local governments' own land use ordinances. The Board and Department issue no permits for stormwater discharge or runoff and have no direct enforcement authority over specific stormwater management requirements of the program. The Board, however, is authorized to take administrative and legal actions to ensure that local governments comply with provisions of the Act and Regulations.

4) VIRGINIA MARINE RESOURCES COMMISSION (VMRC), Habitat Management Division
2600 Washington Avenue, P.O. Box 756
Newport News, Virginia 23607
(804) 247-2200

Role relating to stormwater:

- o Issues subaqueous permits for the encroachment of stormwater management facilities into state owned subaqueous waters and for stormwater outfall pipes discharging into state owned waters.

VMRC conducts the joint application review process with the U.S. Army Corps of Engineers and the Virginia Department of Environmental Quality (DEQ) for construction and discharge into waters of the Commonwealth, tidal wetlands, and bottoms of waterways throughout Virginia. VMRC, in consultation with the COE and DEQ, issues subaqueous permits for stormwater management facilities or outfall pipes proposed to be encroaching and/or discharging into state owned subaqueous grounds (perennial streams) and has oversight authority over local wetlands boards.

Federal Agencies

1) ENVIRONMENTAL PROTECTION AGENCY (EPA) Region III
841 Chestnut Street
Philadelphia, Pennsylvania 19107

Role related to stormwater:

- o Responsible for development of a phased approach to regulating stormwater discharges under the NPDES permit program

EPA is the principal federal environmental regulatory agency. Regarding stormwater management, EPA is responsible for the development of regulations establishing permit application requirements for stormwater discharges from municipal separate stormwater systems serving populations of 100,000 or more and for stormwater discharges associated with industrial activities. EPA has authorized DEQ to administer the federal NPDES program (established by the Clean Water Act to limit discharge of pollution into streams, rivers and bays) and has given responsibility for the implementation of the federally mandated program for stormwater discharges to DEQ. EPA maintains authority to review any applications or permits. (For more information on this program see the DEQ section).

- o Reviews major stormwater dischargers NPDES permit applications

EPA has delegated the administration of the federal NPDES permitting program to DEQ, however major dischargers in Virginia require EPA review.

2) U.S. ARMY CORPS OF ENGINEERS (COE) (Norfolk District)
803 Front Street
Norfolk, Virginia 23510-1096
(804) 441-7652

Role related to stormwater:

- o Issues permits for placement of stormwater management facilities and stormwater discharges into wetlands and waters under Federal jurisdiction

The Army Corps of Engineers participates in the joint permit process with the Virginia Department of Environmental Quality (DEQ) and the Virginia Marine Resources Commission (VMRC). The Corps reviews permit applications for compliance with federal regulations and issues permits, in consultation with DEQ and VMRC, for stormwater discharges and stormwater BMP placement impacting jurisdictional wetlands and rivers. The Corps may not issues a federal permit until the DEQ has issued a Virginia Water Protection Permit.

3) FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) Region III
105 South Seventh Street
Philadelphia, Pennsylvania 19106
(215) 931-9418

Role related to stormwater:

- o Provides incentive for communities to adopt stormwater management programs, plans, and ordinances

FEMA, through the NFIP - Community Rating System (CRS), provides points to participating localities for performing certain activities and providing certain services to their communities. Depending upon the amount of points earned, flood insurance rates are reduced between 5-45% for residents in the participating locality. Regarding stormwater management, points are given to localities for the adoption of stormwater management ordinances and development of stormwater management plans. This program is voluntary, not mandatory, and the reduction in flood insurance is the incentive for localities to address issues relating to flooding, such as stormwater management.

4) U.S. SOIL CONSERVATION SERVICE (SCS)
Culpeper Building, Suite 209
1606 Santa Rosa Road
Richmond, Virginia 23229
Williamsburg Office: (804) 564-1870

Role related to stormwater:

- o Provides advisory stormwater management assistance to farmers and local governments, if requested.

Soil Conservation Service maintains local offices which assist farmers in a variety of areas including stormwater management and the development of erosion control plans and projects. SCS is advisory only, not a regulatory agency.